THE

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OF

THE ASIATIC SOCIETY

OF

BENGAL.

VOL. II.

THE

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OF

THE ASIATIC SOCIETY

OF

BENGAL.

EDITED BY

JAMES PRINSEP, F. R. S.

SECRETARY OF THE ASIATIC SOCIETY.

VOL. II.

JANUARY TO DECEMBER,

1833.

"It will flourish, if naturalists, chemists, antiquaries, philologers, and men of science, in different parts of *Asia*, will commit their observations to writing, and send them to the Asiatic Society at Calcutta; it will languish, if such communications shall be long intermitted; and it will die away, if they shall entirely cease."

SIR WM. JONES.

Calcutta:

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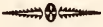
1833.

PREFACE.



On completion of this second volume of the Journal of the Asiatic Society, the Editor feels it to be due to his subscribers, as well as to himself, to lay before them as briefly as possible, the results of the arrangements which he contemplated carrying into effect at the conclusion of the last volume;—more especially as a somewhat erroneous estimate of the cost and circulation of the Journal found admission into a late notice of the Indian Periodical Press, drawn up by the Editor of one of the morning papers. The Journal is not published, as there stated, by the Asiatic Society, but solely at the cost and responsibility of the Secretary, who was Editor of it before he enjoyed the honour of an election to that office. Since there never has been the least view to profit, either in the Gleanings or in the present work, there can be no object whatever in concealing any information respecting its publication; and it may be useful hereafter to find on record a note of the expences of printing, and the difficulties against which a Journal exclusively scientific has had to contend, as well as the advantages which it has enjoyed, in India at the present time. The following particulars have therefore been extracted from the accounts of the two years now terminated.

The amount of subscriptions to the Journal at one rupee per number, including two extra numbers, in 1832, was .... Rs.		5148 8
From this, deducting 20 per cent. commission paid to Messrs. Thacker and Co. for circulating it, ...		1028 11
There remained net subscriptions available, Rs.		4114 13
The Baptist Mission Press charged for printing and stitching 500 copies, Rs.	3742 10	
And the 15 plates cost with printing,	416 5	
Total		4178 5

The result of the first year exhibits a sufficient accordance between outlay and return. Of the amount subscribed however, only Rs. 3786 13 have been collected up to the present time, so that in fact there was a deficit of Rs. 392 2.

The alterations which the Editor proposed and completed for the second year were:—

1. The saving of nearly half of the commission paid for the mere circulation of the work (without responsibility), by undertaking that duty with the aid of his establishment as Secretary of the Asiatic Society;

2. As a return for this favor, he proposed circulating the Journal gratis to such of the paying members as should express a desire to take it in.

The effect of this scheme has been as follows:

Fifty members of the Society have availed themselves of the privilege, which has made a deduction to the same amount from the monthly receipts. The number of copies circulated, including those sent to subscribers and societies in Europe, is about 450.

The number of paying subscribers on the list, is 320, which at 1 R. per month, (including one extra number of Buchanan,) would give Rs. 4480.

The expenses of printing 500 copies, of 670 pages,

at 4-5 per page, may be stated at	Rs. 2,890	
144 pages of Buchanan, at 4-8 per page,.....	648	
Covers, table work, &c. charged extra, ...	250	
40 pages of Appendix, at 5 Rs.....	200	
28 plates (18 lithographs, 10 engravings*), ...	480	
Establishment for circulation, ...	600	
	——	5,068

Leaving a loss on the year of Rs. 588, or nearly as much as the subscriptions of the members exempted from paying.

But it must be mentioned, and mentioned with a degree of disappointment which is almost disheartening, that of the flattering list of sub-

* For these the cost of printing and paper only is charged.

scribers above given, 70 have not paid any part of the year's subscription, and as many more are still in arrears; so that a balance of Rs. 1321-8 still remains to be collected. The actual state of the concern is therefore by no means so favorable as could be wished, for it leaves the Editor out of pocket upwards of 2000 Rs. as the reward of his labour for two years ! B ǝɥ ɹnwill not for a moment suppose that the balances outstanding are not recoverable: on the contrary the principal difficulty lies in the distance, and the supposed want of a mode of remittance.—Many subscribers are not aware, that letters containing hoondees for the amount may be transmitted *post free* to the Editor.

It will be remembered, that the Bengal Government were pleased to bestow the privilege of free postage on the GLEANINGS and on the JOURNAL, on condition of the publication of the late Dr. Buchanan's Statistical Reports. Under the impression (justly formed) of a corresponding increase of circulation, consequent upon this liberal boon, it was resolved not to incorporate these records in detached notices in the JOURNAL, nor to diminish from its original matter*, but to publish them as a separate work; and one volume has accordingly been completed, containing 356 pages, which at 4-8 per page have cost Rs. 1,602

And a reprint of the first 108 pages, which became necessary on the subsequent extension of the edition from 300 to 500 copies, 216

Total, Rs. 1818

This expence has been incurred therefore on account of Government, in return for the postage saved, not to the work, but to the subscribers of the JOURNAL. On the completion of the first volume of BUCHANAN, a second extra volume of an official nature on the Monetary System was commenced, of which 50 pages have been printed with 3 plates, being in fact an expence of more than 300 rupees not included in the above estimate. The Government meantime placed the remaining volumes of Buchanan in the Editor's hands, with an intimation of its "desire that the printing of these records should be continued." It was therefore with no small feeling of mortification that

* Originally 32 pages only were given in each number, latterly 64.

the EDITOR perused the following letter, announcing that the privilege of free postage should cease from June next, especially after having been honored, on an explanation of the nature of the work, with an extension of the same privilege to the Madras presidency, in addition to that formerly bestowed by the Governors of Bombay and Ceylon.

To JAMES PRINSEP, Esq.

Editor of the Journal of the Asiatic Society,

Genl. Dept.

Sir,

I am directed to inform you, that the Governor General in Council has resolved, that after six months the exemption from postage, which is now enjoyed by the Journal of the Asiatic Society, shall be discontinued.

I have the honor to be,
Sir,
Your most obedient servant,
G. A. BUSHBY,
Offg. Sec. to Govt.

Council Chamber,
2nd Dec. 1833.

It may reasonably be feared that many subscribers at distant stations may be unable to continue their support to the work, when its cost shall be enhanced by postage; but (should it be impossible, on a proper and respectful representation of the circumstances, to avert the imposition of postage) every means will be taken of lessening the burthen by sending the monthly numbers by the bangy instead of the regular dâk.

On the contents of a volume which has already been perused by nearly all to whom it circulates, it would have been obviously needless to make any remark, were it not desirable to prove that the favors hitherto conferred upon the work by the Government of the country had not been altogether misapplied.

Independently of the volume of Dinajpur Statistics, which forms a model for the use of public officers engaged in collecting similar information, the GLEANINGS and the JOURNAL have been the means of bringing to notice many of the mineral resources of our vast Indian Empire, and of leading to fresh discoveries by the announcement of what had already been found: coal may be adduced as an example,—of which twenty or more different localities have been brought to our knowledge through its pages, where only two were before known. Of the native mineral productions, iron, copper, gold, &c.:—Of the native arts and manufactures, salt, nitre, turpentine, dyes, mills, &c. numerous original ac-

counts have been inserted : catalogues of woods, medicinal plants and drugs : experiments on materials, wood, iron, cement ;—Statistical reports;—descriptions of newly explored countries and people :—in fact, it would be difficult to open a number of the JOURNAL without finding some information which must possess value in the eyes of a government. Contributions of a more exclusively scientific nature have, in the mean time, continued to multiply, and the objects pointed out as desiderata at home in the geography, meteorology, geology, and natural history of this country, are in the course of rapid and systematic elucidation. So numerous for instance have been the registers of the weather offered for publication, that space could only be found for abstracts of many. There has hardly been time for the collection of materials regarding the tides of the Indian coasts, suggested in the Rev. Professor WHEWELL's circular, (inserted in page 151,) but the attention of those who have opportunities of eliciting the information required, is again solicited to this object.

As a proof of the benefit conferred on science by the free and extensive circulation of a periodical devoted to such objects, the Editor feels pride in alluding to the ardour which his plates of ancient coins have inspired in many active collectors, and above all to the reward bestowed on himself by the munificence of General VENTURA, the most successful pursuer of antiquarian research in the Panjáb, who has presented to him all the coins and relics discovered on opening the celebrated Tope of Manikyala. They are now on their way to Calcutta.

That extracts and analyses of European science have not been more frequent must be attributed once more to want of space and want of leisure. The Editor would recommend all who seek for knowledge of the progress of science in Europe to procure a copy of the Reports of the British Association for 1832, in which they will find every branch discussed by the philosopher best able to give it illustration. To attempt to shorten those admirable essays would be mutilation rather than abridgment ; yet unfortunately most of them are too long for the pages of a monthly journal.

On the subject of orthography of native words, the Editor is driven to make one concession, for which he fears the learned Societies at home

will denounce him as an apostate to the system of their leader. Every communication, with hardly any exception, which comes for publication, adopts the Gilchristian mode of spelling, or that modification of it which has been *ordered* to be used in all Government records, surveys, &c. An attempt has been made hitherto to conform the whole to Sir William Jones' method, but necessarily there have been continual omissions, and the contributors in most cases express themselves but ill pleased to see their words transformed into shapes but ill accordant with ordinary *English* pronunciation. The Editor has therefore resolved to adopt the middle course followed in Hamilton's Hindustan, namely, to print all Indian names and words in the ordinary roman type as they are usually written and pronounced, and to place in italics all such native terms and proper names, as are corrected, and spelt according to the classical standard of Sir William Jones : in many cases the latter may be inserted in brackets after the ordinary word.

Where contributors have occasion to illustrate their papers by plates, it will be a great convenience to the Editor to have the original drawings prepared of the same dimensions as the printed page of letter press, to save the trouble and expence of reducing them.

The Editor will not allude in this place to the severe loss he has sustained in the death of some of the most able and constant supporters of his work, and the departure to Europe of others in the course of the past year; since he hopes that a more worthy channel will be found for the record of their meritorious labours for the cause of Science in India, in the Proceedings of the Asiatic Society, to which their names belong, and in which their reputation must ever be cherished with fond remembrance.

1*st January*, 1834.

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JOURNAL

OF

THE ASIATIC SOCIETY.

No. 24.—*December*, 1833.

I.—*A short Account of the Charak Púja Ceremonies, and a Description of the Implements used.* *By* Ram Comul Sén, *Native Secretary, Asiatic Society.*

[Read before the Asiatic Society, in 1829.]

In describing the instruments used in the *Charak Sanyása* presented by me for the Museum of the Asiatic Society, a short notice of the origin and practice of the ceremony appears to be necessary to illustrate the subject.

The word *Charak* is derived from *Chakra* or *Charaka*, which means a circle, and is used to signify moving or swinging in a circular direction; *Charak Sanyása* implies leaving off worldly business, living abstemiously, observing austerities, for the propitiation of *Siva*. It is a festival improperly termed by many *Charak Púja*, perhaps from the notion that every ceremony observed by the Hindus of Bengal, is a *puja* or religious worship; and whether it be performed by a *muchi* or *chandála*, is considered as Hinduism, and the whole body of the Hindus are charged with the absurdity of the act.

There are two kinds of *Sanyásas*, called *Siva Sanyása*, and *Dherma Sanyása*; the first is celebrated in the month of *Chaitra*, and the second in *Baisákha*; the people who practise these *Sanyásas* are termed *Sanyásis*, and the priest who presides in the ceremony is called a *Gajaneyá* brahman: the Charak festival is also called *Gajana*, (*Gá* or *Grama*, village; *jana*, people,) being observed by the villagers. There are several ranks amongst the *Sanyásis*, such as *Múla* or head; *Dhula*, or subordinate; *Sain*, or followers. The time occupied by the *Charak Sanyása* is a whole month, and that of the *Dherma* is a fortnight; during this time the *Sanyásis* live abstemiously, and observe various ceremonies to be noticed below.

This act is performed by the Sudra class only, and generally by the lowest castes and most dissipated characters; some of them consider it as an act of piety and religion, in commemoration of the austerities performed by Vana Raja, a king and Daitya, who by acts of self-torture and denial obtained the special favour of Maha'deva, and who first introduced the festival; but the greatest number engage in it as a lucrative exhibition, or from a desire to acquire a character for courage in the opinion of their friends. In some cases, the rite is compulsory: the parents make a vow to Siva, when involved in trouble and disasters, that their children shall perform *Sanyásas*, for a certain number of years, which the sons must fulfil.

The form and manner of *Sanyásas* varies: the original ceremonies consisted of,

1. *Phala Sanyása*, playing with fruits.
2. *Phula Sanyása*, do. flowers.
3. *Nila Sanyása*, worshipping Nilavati, a goddess.
4. *Jhula Sanyása*, hanging, and
5. *Charak*, swinging. These have been multiplied, and additions have been introduced by the people according to their fancy.

The original rules have mostly fallen into disuse, and new ones have been substituted, as convenience required. The time of *Sanyása* has been reduced from 30 days to 15, 8, 4, and 2, and in some cases only one day is taken. The ceremony which was called an act of piety, is converted into an occasion of dissipation, drinking, gambling, and acts of immorality.

The following are the ceremonies at present in practice:

1. *Phala Bhánga* and *Kánta Sanyása*, or falling upon the branches of prickly plants, spread on the ground, collecting them, as well as fruits, and living solely upon fruits: the *Sanyásis* go in company, and climb upon date and cocoanut trees, and collect fruits; when they come back to the place of Siva, with the fruits so collected, they throw and distribute the same; they also receive presents of fruits. Barren women resort to the place, on the occasion, and spread cloths, on which if by accident a fruit falls, they receive it with joy as an omen of their becoming pregnant through the favour of Siva; at the same season, the *Múla Sanyási* with his deputy goes into a forest, a burial place, or on the bank of river, &c. and there performs the worship of Yama (king of death), and presents, as offerings to the evil spirits, boiled rice and roasted fish.

Pátá Sanyása.—Falling from a scaffold erected before Siva, upon a row of *Batí* or knives. It is called *Háta Sanáysa* and *Ghóti*

Sanyása, because the scaffold is erected in a market place, and on the bank of a river; afterwards when the *Sanyásis* return to the temple of Siva, they lie on their backs, upon the bare ground, in a row, close to each other, and the *Gajanaya* Brahman passes over them, treading upon their breasts.

Phúla Sanyása.—Collecting and playing with fuel; which they often procure by plundering gardens, and carrying off railings, loose doors, window frames, &c. They then make a large bonfire in the evening, and jump and walk over the flame, and play with the burnt charcoal, throwing the same upon one another; this is also called *Aguna Sanyása.*

Nila Sanyása—is the worship of Nilava'ti, a wife of Siva: the *Sanyásis* visit Kálighát or temples of Sacti and Siva, where they pierce their sides, tongues, and the skins of their foreheads. This is called *Bána Phorá*, and on the occasion they collect presents and gifts from the spectators, who far from encouraging these self-tortures, pay them something to get rid of the sight of their bleeding limbs.

Jhúla Sanyása,—is climbing upon a scaffold, hanging with the head downward, and making a fire below. The fire is fed with the powder of Indian pitch.

Charak.—Eating *Chehatu* or *bran*, and swinging on the *Charak Gách* or post, erected for the purpose. Among these *Sanyásis* there are several other ceremonies of note, some of which must be noticed here: *Khátuní*, shaking and turning the head, rolling about the shrine of Siva, beating the forehead, sitting up all night, and singing *Tarja*, or songs addressed to Siva; sometimes, but not always, in his praise. *Phúla há dána*, extracting or receiving the flowers laid upon the Linga, which they think fall down at their solicitation; and prayers to the god, who is pleased to throw them down as a sign of affirmation or negation to the question made to him by the *Múla Sanyási*, or the priest for himself or on behalf of his friends. If the flower does not come down after a certain time, it is then supposed that the god is not propitiated, and the *Deyule*, (proprietor,) *Mandala*, (agent,) the *Múla*, (head,) and other *Sanyásis*, and sometimes the priest himself, are tied up by the hands, and suspended to the verandah, all round the shrine of Siva, while the *Sanyásis* redouble their *Khátúní* before the idol, and the drummer beats his drum with all strength; the *Sanyásis* and others remain suspended from off the ground till the flowers fall. The flowers are at first laid upon one another, and then placed upon the top of the Linga, which is oiled, and is consequently slippery: water is thrown upon it by drops, which assists to wash off the flowers, and

when it is obstinate, some person on the part of the priest, contrives to knock it off with a stick unperceived.

Description of the Instruments used in the Charak, of which Specimens are deposited in the Museum and numbered accordingly.

The Vetrasana is an instrument made of ratan, No. 1: it means a seat of ratan, it is the staff of the *Sanyási*, a number of ratan folded in the middle and tied up together, leaving a few inches open in the lower part, in an oval form, the upper part is kept loose. Its use is various—it is a sacred ensign of authority, which must be respected on particular occasions by the *Sanyásis*, who rattle it as their musical instrument, in their procession; it is made a broom for cleaning the place of Siva, where the use of common broom is forbidden during the *Charak*. It serves as a weapon, with which they fight, or beat down the bundle of thorns used in the *Kánta Sanyása* upon which they fall; they use it in playing with the burnt charcoal in *Phula Sanyása;* it is used as ropes laid under the pot or bag No. 2, in the *Pat Sanyasa*. When any dispute or difference arises between the priest and *Sanyásis*, or when the latter in their procession meet with another party, they lay down the *Vetrasana* across the road and the entrance to the house of Siva, and the party against whom it is laid down must instantly stop; it is a sacred bar which they must not pass over without violating the law of *Charak*, and committing a sin which would disqualify them from becoming *Sanyásis* again. They are finally allowed to pass only in compliance with certain conditions; and certain questions relative to Siva, delivered in verses, called *Tarja*, must be likewise answered before the new comers are allowed to pass, and beat their drum, or do any business.

Sutasana, or a cord of twisted thread, No. 3; it is in two pieces, which they pass beneath the skin of the sides, arms and thighs; the ends are held by two *Sanyásis* or assistants, whilst the man dances and passes to and fro. This purpose is also answered by log-line, No. 4, ratan, No. 5, split bambú, No. 6.

Dasnakhi, (No. 7,) two pieces of iron rod, about 2 feet long: one end is pointed, which is passed into the sides, and the other is fork-shaped with prongs, each of which is called *nakha*, or nails, or finger-nail; the two pieces have often 10 nails, hence it is called *dasa-nakhi* or ten-fingered, but it is has often three prongs: the upper ends are flat, and laid upon one another, which serves as a bed for fire, or a lamp, made of cotton dipped in ghee; which is lighted, and upon this the powder of Indian pitch is from time to time thrown, so as to make a blaze, while the *Sanyási* dances as he goes.

Bati, or knife, No. 8.—Eight in number, fixed upon two pieces of boards, in a leaning posture, placed upon a bag, No. 2, stuffed with straw. This bag is held by four persons, aloft from the ground, and two *Sanyásis* join their *Betásana* No. 1, and lay the same across, to render to the bag additional strength, and the *Sanyásis* fall upon it from the scaffold, No. 9.

Visesaya, No. 10, or nails to the number of 120; one end is flat, the other is pointed and sharp, these are run into the skin of the forehead, upon both arms, and breast, in an ornamental form, close to each other, usually like the front or facing of a jacket. To the ends of the nails small beads or peas are attached or suspended like garlands hanging upon the forehead, and small pieces of talc are suspended by way of decoration.

Fig I.

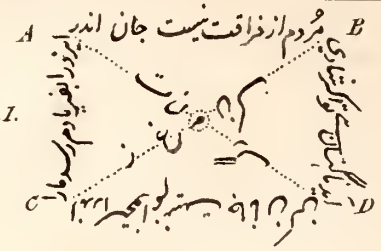


Fig. 4.

Fig. 3.

Fig 2.

Fig. 5.

Fig. 6.

Fig 7

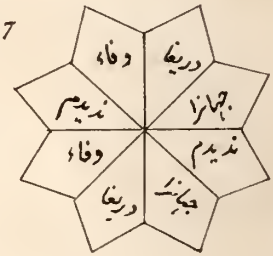


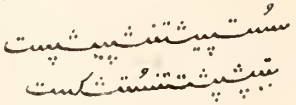
Fig. 8.

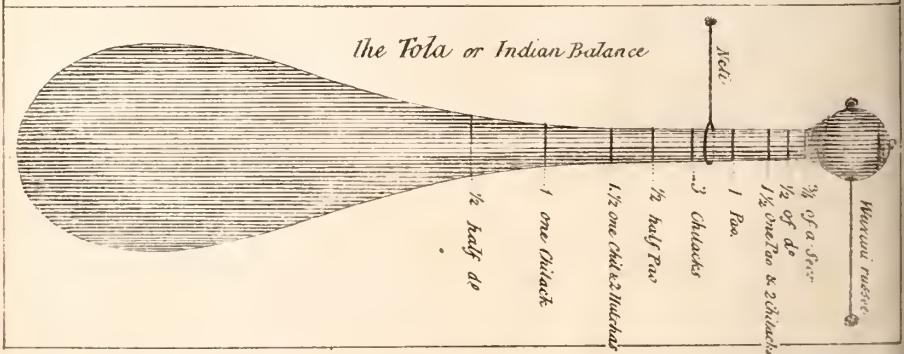
B

از فرقت	اَندلبر	من دایم	بیمارم
اَندلبر	کرعشقش	یاد ردم	بیدارم
من دایم	باد ردم	بی مونس	بی یارم
بیمارم	بیدارم	بی یارم	غمخوارم

D

Fig. 9





Banas, Nos. 11, 12, 13, or arrows, iron rods of various sizes and thickness, used according to the strength and courage of the *Sanyásis*, whose tongues and sides are bored, and the rods are let in, which they often move about. When it is perforated, the tongue and the rod rest upon the lower jaw, or are held between his teeth; if it be heavy, another person holds the ends.

Kupalí, No. 14, is an iron rod or nail: the lower end is pointed, and is passed through the skin of the forehead, the man holding it close to his nose, or a bandage is tied round the head, to prevent it from falling; a small lamp is attached to its top, which he burns on the day of Nila.

Charak kánta, No. 15, or swinging hooks. The *Charakí*, or one who swings, is often of the bearer caste, and other people, not *Sanyásis*, volunteer for this act, through the effect of liquor.

The skin of the back being drawn out, a perforation is made with a lancet, No. 16, on each side of the back-bone, and the hooks, No. 15, are let in; the twine attached to the hooks is tied to the rope, suspended to the *Charak Gácha*, No. 17. If the skin of the *Sanyási* is thin, or he is weak, a bandage of cloth is tied round his chest, to prevent the hooks from giving way, as when they break the *Sanyási* falls, and is generally killed; the standers by also are sometimes severely hurt.

No. 18, 19, 20 and 21, *Belkars*, or lancets of various sizes and thickness: with these the skin is bored. These are not kept by the *Sanyásis*, but procured from certain *kumárs* (blacksmiths), who attend the place where the *Sanyásis* meet, and receive a certain fee, which varies from 2 annas to 2 rupees for each subject. The lancets are of various sizes, and a number is always brought by the operator.

Nagapasa, No. 22, two long pieces of iron, with a snake head, hooded top; two of these are run into the neck and back of the head, and brought down to the waist; each has two borings at least, one on the head skin and one on the back. The *Sanyási* who can submit to this torture is considered a great hero, and when two similar ones are put in, he cannot turn or bend his body without breaking the skin through which they are bored.

There is also a head piece, No. 23, made of iron put upon the head; it has 3 to 5 pieces fixed to it like the hoods of serpents.

Charak Gách, No. 17, or a post, commonly of saul wood, for swinging: it is from 29 to 30 feet long, fixed into the ground, the upper part has a notch, or socket, called *Mocha*, B; in which a movable pivot is let in, called *Khakúyl*. On this, a cross piece made of bambús 5 to 10 in number is tied up together, and placed across the *Khakúyl*; to both ends of the cross thick ropes are suspended, one of which is tied to the hook, No. 15, and on which the *Charakí* swings.

II.—*Specimens of some Ornamental Forms of Persian Writing. By Mahá Rájá* Káli Kishen *Behadúr, of Calcutta.*

The accompanying figures, representing some beautiful poetical inventions of the latest authors, are extracted and translated from a Persian book called "*Mujmua-us-sanáyá*," (or Collection of Arts,) compiled by Nizám-ud-Dí'n Ahmed, son of Muhammed Sánih, in the year 1060, Hejri.

Fig. 1. (Plate xxi.) المعقوب *Ulmaáqúb,* or anagram that retains the same meaning, even when it is read in various directions.

In this, the central م (*m*) is the first letter of every hemistich. The reading will run equally well by beginning first from م towards B, thence continuing towards A, and from A returning to م; then back again from م to A; from A to C; and back again to م; further, from م to C; then from C to D; and finally from D back again to م.—Translation.

"I am dead on your separation and have no soul in my body,
For God's sake hear my sorrowful lamentation.
I have no marrow in my bones, O love, be kind to me,
Happy if I instantly die when separated from you."

Fig. 2. المشجر *Ulmoshojur;* the arborescent form.

In this the Arabic letter *m* is round, differing from the shape of the Persian. م, placed in the centre of the circle of which the branches form radii, is the beginning of each word; and the stars 1, 2, 3, 4, mark the end of as many hemistichs; the reading of the first begins semicircularly from B to C.—Translation.

"I am fond of the curled locks of beauties,
And I am captivated by their moon-like faces.
I drink wine and am constantly a drunkard in the tavern,
And I give thanks to the God of the heavenly kingdom."

Figs. 3 and 4. المعقد *Ulmoaqqad,* or the representation of knots.

From the central م commencing along either side at the letter E or F, and terminating where we set out, we shall arrive at the conclusion of two hemistichs.

The reading of either hemistich should be directed alternately from the right and the left hand, in order not to lose their respective sense and metre.—Translation.

"Be not intoxicated, and do not go to the intoxicated ones,
O thou possessed of moon-like face;
Do not display vanity like the brilliant moon.
Thou hast charmed hermits, kings, and angels,
Bewitched the beauties by thy moon-like face."

Figs. 5, 6, and 7. The beauty of the construction of these three figures is, that the reading may follow any order of the compartments without altering the sense.—Translation.

"The world with its riches is under your subjection,
O Love, it is tyranny that thou hast not afflicted my heart:
Alas, there is no faith in the world; alas, there is no faith in the world."

Fig. 8. المربع *Ulmorabáa,* or a quadrilateral figure containing four hemistichs, and these are read in both horizontal and perpendicular

directions, beginning either from any of the four upper compartments downwards, or from any of the four perpendicular compartments of B, D, sideways, from right to left; and the same verse will be found.

"I am in constant affliction owing to the absence of that ravisher of my heart;
That ravisher of my heart whose love keeps me awake with affliction.
I am constantly in pain without a companion and without a friend;
I am sick, I am awake, and without a friend and without a sympathizer."

Fig. 9 شکل ارہ *Shakl-i Arrah*, or saw-like form. The ابیات *Abeátí* distichs are read in the usual manner as follows:

سست پیش تنش تپش پست بتپش پشت‌تن سست شکست

III.—*Description of an Indian Balance, called Tula. By the same.*

[Presented at the Meeting of the 31st July.]

This instrument is made out of common wood, but generally *Súndrí* (Herritiera minor) is used.

It is employed by the *Músulmán Kághazy*, or paper-makers, for the purpose of weighing old and useless papers; it is also used for weighing cotton, as well as thread, by native weavers of both sexes.

The marks of division around the beam are the indications of different weights, as particularized in the accompanying drawing.

The larger string, named *wazni-rassi* (or the string for suspending weights), is introduced through a perforation at the end of the beam; and the little *one*, termed *neti*, is for holding by the fingers to ascertain the weight, by applying it on one or other of the marks above alluded to.

The accompanying plate (Plate xxii. fig 8) is one quarter the ordinary size of the instrument, but some are a little larger, and others smaller.

It is in principle similar to the Roman steel-yard, the fulcrum shifting instead of the weight.

IV.—*Abstract of a Meteorological Journal, kept at Kotgarh, (Lat.* 31° 18′ 45″ *N. Long.* 77° 27′ 49″ *E.) Subatkú, and the intermediate places in the Himálaya mountains, for* 1819-20. *By Captain* Patrick Gerard, *9th Regt. B. N. I.*

The voluminous nature of these journals, which were presented by Captain Gerard to the Asiatic Society some years ago, has hitherto prevented their seeing the light. The very circumstance which constitutes their value as a record,—the minute detail for every hour of the day, continued with little interruption by an indefatigable observer, for a period of two years,—having in the end thwarted his views and his

reward, while they have deprived the scientific of a most valuable and well digested register of meteorological data. It would be impossible to devote space for their entire publication in the pages of this journal, but such an abstract as we have gleaned from many similar tables on former occasions, and which will suffice for most purposes of a general nature, especially for that we have hitherto kept in view,—the fixing of the *constants* of diurnal and monthly range of heat and pressure for as many points as possible on the continent of India,—we now with permission present to our readers : prefixing Captain Gerard's account of his instruments and of his method of observing.

"With regard to the tables which I now transmit, I beg to state that, generally speaking, the means of the observations, whether of the barometer or thermometers, attached or inside, and detached or outside, in the air and shade, taken during a march or halt or temporary intermediate place of encampment, are deduced from the highest during the day, and lowest the following morning, which will furnish a correct mean of the place for the day. The attached or inside thermometer at Kotgarh was rather open to a westerly aspect, the observations being taken in a room of the house to the westward, thereby shewing a somewhat higher temperature than if taken in a room towards the north. This was merely done for the sake of convenience. The detached or outside thermometer was suspended on a pole fixed in the ground for this special purpose, apart from the house, from day-break or early in the morning, to the north-west side for nearly half, and to the N. N. E. side for the remainder of the day, in the air and shade, to obviate as much as possible the sudden effects arising from reflection from the earth and the sun's rays in clear, settled, and hot weather; which would thereby indicate a higher, and consequently somewhat a more incorrect temperature of the air, than it otherwise ought to do, had it been hung at a considerable distance from any building better situated and free from the influence of all or any degree of reflection, so liable at all times to raise it above the true standard.

The barometer used during the two years, to insure accuracy as far as practicable in the instrument, was unexceptionable in every respect, being filled with pure mercury, carefully revived from cinnabar, by distillation in a retort, with the filings of iron, and gradually boiled over a slow charcoal fire from the sealed end upwards, which process is always tedious and difficult of accomplishment.

As not less than ten or twelve observations were taken and recorded daily with nicety, the correctness of the following tables may be relied on.

I possessed no instruments for ascertaining the density and humidity of the atmosphere, evaporation, or the quantity of rain which has fallen during the years under review. The winds stated as stormy, strong, brisk, steady, moderate, gentle, little, and light, have been estimated by their supposed strength unaided by a guage, to indicate their actual force. The same may be noticed in regard to the quality and appearance of the clouds.

The sudden creation and increase of clouds, spontaneously rising from dells and valleys, subsequent to rain and snow*, more especially during the periodical

* During the rainy months, the clouds, after rising, forming, and collecting, ascend to a certain altitude, and generally remain stationary, and frequently day after day about the same time come down again in rain.

rainy and winter seasons, on the hither or Indian side of the Himálaya range (the opposite or ultra side of the Himálaya being little subjected, and that only for a short distance into the interior, from the loftiness of this grand and extensive barrier of mountains separating India from other parts of Asia, to such a deluge), are more astonishing to the beholder than I have words to describe, and their total disappearance in a short space of time (sometimes indeed almost in a moment) is equally surprising. I have often remarked these without any apparent cause during calm settled weather, moving in all directions in heavy loose masses; at other times with incredible velocity, resembling spray, down a ridge or valley, till they reach a certain point, when they evaporate, and in an instant disappear. Sometimes they may be seen in all shapes and curious forms, and frequently they accumulate and disperse in a manner quite astonishing to the spectator. They will rest for days, and even weeks, upon the top, and the slopes of the high surrounding ranges and mountains, defining a clear outline around*, thereby condensing and confining the atmosphere within certain limits at an altitude of 8000 feet and upwards, (rarely at a less elevation for any time,) above two or three days, and making it close and sometimes unpleasant to the feelings, although the thermometer may indicate a low temperature at the time; and often in clear, cloudless temperature and mild weather, small patches may be seen stationary in some places, and suddenly gliding along and up the declivity or slope towards the tops of the mountains, and dispersing quickly in others†.

The principal places at which any number of observations were taken are Rampúr, Kotgarh and Subathú. At intermediate places, during a march or temporary halt, the observations taken were recorded.

The latitude, longitude, and elevation above the level of the sea‡, together with the name of each village, town, and encampment, on the journeys made each year; the state in which comprised; and to what authority now subject, will be found detailed in a table or "List of Places, &c." at the end of the abridgement, and other tables for each year.

The point of ebullition and the temperature of springs, rivers, and streams have not been omitted at most places in the subsequent sheets, during a journey. The utility of the former, when unaccompanied with a barometer, is too evident almost to need illustration. It will give a tolerable idea of the elevation of different stations; while the second, which were only ascertained at a few places, will nearly shew the mean temperature of the year at different altitudes; and the latter will certainly, from the diminution of temperature, indicate a tolerable estimate of the distance of the source of the rivers in the water of which the thermometer may have been dipped, and an observation taken of its temperature. If rivers and streams indicate a high temperature, the source of them may reasonably be considered to be remote; but if a low temperature be evinced, the contrary may be supposed to be the case. Certain local circumstances and influences may in some degree affect the temperature of rivers."

* These remarks apply to *Kotgarh* and its neighbourhood, and indeed from *Simla* upwards, as I can affirm from my own long observation.

† The sun's rays after rising have in general this effect.

‡ For these on the present as well as on the former occasion I am indebted to my brother, Captain A. Gerard, late Surveyor in Rajputana and Malwa; and for a few of the latter, and partly some of the observations of the barometer and thermometer during my occasional short visits to Subathú, to my brother Mr. J. G. Gerard, Surgeon to the 1st Nassiri battalion, stationed in these mountains.

Summary of Captain P. Gerard's Meteorological Registers for 1819-20.

Place.	Month. 1819.	Barometer 32°. max. at 10 A. M.	Barometer 32°. min. at 4 P. M.	Barometer 32°. mean.	Temperature in the house. max.	Temperature in the house. min.	Temperature in the house. mean.	Temperature outside, in the shade. max.	Temperature outside, in the shade. min.	Temperature outside, in the shade. mean.	Winds. no. of days in each direction. Ne.	E.	Sw.	W.	Average force of the wind.	Weather. Clear.	Fair, Cloudy	Rain & snow.	Storms.	
Kotgarh, ...	Jan. 8 to 31	23.585	.557	.568	40.6	35.9	38.3	—	30.6	—	3	10	4	13	gentle	16	8	7	1	Generally fine; snow.
Ditto,.....	Feb. 1 to 28	.699	.650	.675	44.7	41.2	42.5	42.9	33.8	37.6	3	13	1	11	ditto	11	8	9	1	Fair with storms.
Subathú,....	Mar. 1 to 28	25.909	.855	.872	67.9	59.9	63.8	73.5	55.2	64.4	7	0	21	0	moderate	18	7	3	3	Clear and fine.
Ditto, ...	Apr. 11 to 30	.814	.747	.780	73.2	67.1	70.1	80.8	59.6	69.8	3	0	15	1	steady	15	0	5	4	Clear with squalls.
Kotgarh, ...	May 11 to 31	—	—	—	63.1	60.2	61.6	—	50.3	—	0	16	4	11	light	12	5	14	8	Clouds gathering.
Subathú,....	June 5 to 30	.706	.626	.662	81.3	76.7	79.0	84.3	70.5	77.9	5	7	10	7	strong	9	10	10	8	Fair and rainy.
Kotgarh,....	July 2 to 31	23.559	.508	.535	73.1	67.1	69.2	—	60.3	—	1	21	2	7	light	2	10	19	5	Cloudy and rain.
Ditto,.....	Augt. entire	.518	.471	.494	71.3	66.3	68.8	—	60.2	—	2	19	0	10	ditto	1	9	21	5	Much rain.
Marching,...	Sept. do.	—	—	—	65.0	57.0	60.9	—	51.5	—	—	—	—	—	ditto	2	6	22	4	Ditto.
In mountains,	Oct. irregular	—	—	—	60.0	50.0	55.0	50.0	30.0	40	—	—	—	—	gentle	20	5	6	0	Fair weather.
Kotgarh,....	Nov. 16 to 30	.724	.661	.693	49.5	47.1	48.3	—	37.2	—	—	6	—	8	ditto	22	5	3	1	Clear, fine.
Ditto,.....	Dec. 1 to 25	.744	.680	.711	46.6	45.6	46.1	—	39.3	—	4	16	8	3	light	11	13	7	1	Fair, cloudy.
											28	108	65	71		139	86	126	40	
	1820.																			
Travelling,.	Jan. 11 to 22	.653	.601	.627	41.1	40.0	40.6	—	36.2	—	7	7	7	2	light	26	3	2	2	Clear.
Kotgarh,....	Feb. 9 to 29	.619	.563	.589	45.4	43.7	44.6	—	36.8	—	6	7	2	14	gentle	14	6	9	1	Clear snow.
Ditto,.....	Mar. 1 to 15	.718	.648	.686	52.2	50.6	51 4	—	43.5	—	6	3	—	6	ditto	17	5	9	4	Ditto showers.
Ramgarh,...	Apr.	—	—	—	75.6	59.0	67.5	—	50.9	—	—	—	—	—	ditto	14	4	12	5	Fair and do.
Kotgarh,....	May 11 to 31	.600	.526	.559	66.4	63.6	65.3	—	54.5	—	1	6	2	11	ditto	15	8	8	5	Storms and fair.
Ditto,.....	June entire.	.489	.432	.461	72.1	68.0	69.8	78.1	60.5	70.0	1	13	6	10	moderate	10	9	11	5	Cloudy and do.
Ditto,.....	July do.	.496	.435	.455	71.4	66.1	69.4	77.4	61.4	69.9	5	20	2	4	light	0	3	28	2	Much rain.
Ditto,.....	Augt. 1 to 21	.542	.467	.509	71.4	68.0	70.5	75.0	61.0	68.0	5	13	1	5	ditto	0	9	22	2	Ditto.
Ditto,.....	Sep. { 8 to 12 / 20 to 30	.550	.492	.522	69.3	64.6	66.7	72.1	56.8	64.5	1	16	0	6	ditto	6	11	13	2	Clearing.
Ditto,.....	Oct. entire.	.668	.596	.639	62.5	56.9	59.7	63.2	48.9	56 8	0	17	2	12	ditto	20	5	6	3	Fine weather.
Th. Rampúr,	Nov. 1 to 4	.662	.613	.637	74.8	57.3	66.1	73.4	43.2	58.7	9	1	19	1	gentle	18	7	5	1	Clear and clouds.
Rampúr, ...	Dec. 3 to 31	—	—	—	51.4	44.8	49.4	63.9	37.4	50.7	5	0	25	1	ditto	17	10	4	0	Ditto.
Annual average at Kotgarh,	....	23.624	.562	.593	58.6	55.4	56.9	63 ?	47.7	56 ?	46	103	66	72		157	80	129	32	

With exception of the month of April, so inviting to a resident in the hills for expeditions into the higher and more remote parts of the vast Himálayan range, we find in the foregoing abstract, besides three months at Subathú, a nearly complete annual series of barometrical observations for Kotgarh, a station more than 6000 feet elevated above the sea*, and far enough within the first range of hills to obviate the effects of the currents of air from the plains, as observed in the Dehra Dún by Dr. Royle†. It must not be expected that the regularity observed on the level continent of India will be found in the march of the barometer in a mountainous country, where fluctuations of temperature, moisture, and wind are much more frequent and sudden than in the plains ; still the same general curve obtains through the year, and the diurnal rise and fall is regular and of the same nature as in the plains, not a negative oscillation as is observed at great elevations on the Alps. The average diurnal oscillation or fall from 10 A. M. to 4 P. M. is 0.063 inch : to which adding one-fourth (or, as 30 in. to 23 in.) to render it comparable with the oscillation under a pressure of 30 inches, we have .079, which is only two-thirds of the daily oscillation at Seháranpúr‡, as deduced from Dr. Royle's registers ; we may therefore conclude that at a greater elevation, we should observe a still further decrease until, passing zero, the diurnal oscillation would become negative ; that is, the barometer would *rise* from 10 A. M. to 4 P. M. as observed at the convent of St. Bernard's. The solution of this curious question and the determination of the *zero or no oscillation* altitude, may probably be obtainable from the journals of Captain Gerard or his brother, Dr. J. G. Gerard, who is known to have reached an altitude of 17000 feet, barometer in hand ; and we may confidently trust to their joint exertions in elucidation of it : for one fact of this nature established on certain data will better repay their labours in the course of meteorology than even a lengthened series of ordinary observations.

The thermometrical range out of doors is incomplete, the minimum only being registered : there cannot however be a wide difference between the monthly *mean*, in-doors, and in the open air. The monthly variations deduced from the latter column, (the monthly mean's) or from the column of exterior minima, give nearly the same annual curvature. The following table (column G) takes it from the interior mean. April and October are the two average months for temperature as well as for pressure, but the months of January and February present an anomaly in the barometer being lower than usual for those months in both the years under review.

* 6915 feet, by Capt. Herbert, As. Res. xiv. 336 ; 6600 by subsequent correction, vol. xv. 413.

† See his note on the hour of maximum temperature in the hills, Jour. As. Soc. vol. i. p. 97.

‡ Journal, i. 30.

Table of the mean Monthly and Diurnal Range of the Barometer and Thermometer at Kotgarh in 1819—20, *(the month April being interpolated,) deduced from Captain Gerard's journals.*

Month.	Barometer.			Thermometer.				
	A. Mean height.	B. Deviation from mean annual height.	C. Mean diurnal oscillation.	D. Mean of minima in the open air.	E. Mean of maxima in doors.	F. Mean temperature in doors.	G. Deviation from mean annual temperature.	H. Mean diurnal range (e.—d.)
	in	in	in	o	o	o	o	o
January,..	23.592	—.001	0.052	33.4	40.9	39.5	—20.4	7.5
February,	632	+.039	.052	35.3	45.0	43.5	—13.4	9.7
March, ...	.686	+.093	.062	43.5	52.2	51.4	— 5.5	8.7
April, ...	.623	+.040	.057	47.	58.	57.	+ 0.1	11.0
May, ...	.559	—.034	.074	52.4	64.7	63 4	+ 6.5	12.3
June, ...	.461	—.132	.068	60.5	72.1	69.8	+12.9	11.6
July, ...	.495	—.098	.061	60.8	71.4	69.3	+12.4	10.6
August,...	.501	—.092	.062	60.6	71.4	69.6	+12.7	10.8
September,	.522	—.071	.058	54.2	69.3	66.7	+ 9.8	15.1
October, ..	.639	+.046	.072	48.9	62 5	59.7	+ 2 8	13.4
November,	.693	+.100	.063	37.2	49.5	48.3	— 8.6	12.3
December,	.711	+.118	.064	39.3	46.6	45.0	—11.9	13.3
Mean, ...	23.593	range .250	.063	47.7	58.6	56.9	range 33.3	11.3

In the column (c) of mean diurnal barometric oscillation, the observations at Subathú have been included, as producing a better average; the difference of altitude will in this case have but a trifling influence on the result.

Appended to Captain P. Gerard's tables are catalogues of the latitude, longitude, and barometrical altitude of all the most important points visited in the course of the journeys, whose occurrence is marked by the blanks in the foregoing register. The journey of September, 1819, was made in company with the late Captain J. D. Herbert, to survey the course and level of the river *Satlej*, of which an interesting account is published in the fifteenth volume of the Asiatic Researches. The heights were partly taken trigonometrically, but the majority by the boiling-point method, and a correction of two degrees and upwards was forced to be applied to the instrument used by Captain Herbert, on account of an error deduced experimentally from a comparison of its boiling point with the height of a barometer filled with pure mercury, and well boiled, by Captain Gerard; Dalton's Table of Tensions were used in calculating the volume of the thermometric indications. The latter officer, in his remarks upon the tables before us, explains that his own thermometrical heights were taken with a different instrument, which did not require correction, and that they were calculated by his brother, Captain A. Gerard, on the supposition of the sea level being represented by 30 inches, or 212°. A deduction of 200 feet may in some cases be necessary on this account, but it will hardly affect the *relative* measurements, especially as the

trips were made in April, September, and October, the months, as before stated, of mean barometrical altitude.

The following table contains a selection of some of the principal results of this part of the journal, and if compared with that printed in the Researches, it will be seen to afford the highest confirmation to Captain Herbert's statement; the altitudes and longitudes are from the latter.

In 1820, our author went alone by another route, and made some additions to his list of altitudes. The whole ought to be published, but they would require the elucidation of a route-map and notes of the journey.

On both occasions also, the temperature of rivers and springs was carefully noted, and a sure indication was thence deduced of the distance, direction, and source of the stream; a few of these are inserted below:

Extract from Captain Gerard's Table of Altitudes.

1819. Place.	State.	Latitude. North.	Longitude. East.	Boiling Point.	Elevation above the Sea
Rámpur, capital,	Bussáhir,	31° 27′	77° 38′	206,8	3398 ft.
Nirtnagar, village,	Do.	31 22	77 33	206,6	3087
Kotgarh, cantonment,	British,	31 19	77 30	200,7	6634
Komharsén, capital,	Komharsén,	31 19	77 27		5500
Subathú, encampment,	British,	30 58	76 59		4505
Manlig, encampment,	Patiála,	———	———		4400
Semla, do.	Keonthul,	31 6	77 11		7200
Wartú fort,	Several,	31 14	77 31		10656
Pabar, river near Raingarh,	British,	31 8	77 46	202,7	5700
Rontan, village,	Do.	31 7	77 48	198,5	8900
Encampment in Klashél range,	Bussáhir,	———	———	194,1	12900
Jáko Peak,	Do.	———	———	196,1	9100
Crest of Rúpen Pass*,	Do.	31 21	78 10	185,7	15460
Murang,	Do.	31 36	78 27	197,4	8503
Shipké, in Chinese Tartary,	Tibet,	31 48	78 45	193,8 / 194,0	10597
Hupshang, boundary between	Busahir&Tibet	31 48	78 41		10989
Náku, village,	Bussahir,	31 53	78 38	191,7	12005
Sheálkbar, village and fort,	Do.	32	78 35	194	10403
Kánam village,	Kunáwar,	31 40	78 27	197,2	9000
Wangto jhula, bridge over the	Satlej,	31 32	78 1	203,3	5200
Dalnagar, village, 1820.	Bussáhir,	31 23	77 36		3200
Mandar Ghátí Pass, boundary,	Do.	31 16	77 38		9800
Sirarú Pass,	Do.	31 10	77 37		8885
Purag,	Kotgúrú,	31 7	77 30		6900
Nágkanda Pass,		31 15	77 28		9016
Dubalda range,	Kuranglu,	31 17	77 35		7300
Top of Nankhar range,	Bussahir,	31 17	77 37		7800
Búchkàl, on ascent to	Shatul,	31 22	77 56		11700
Crest of left peak towards Shatul or	Rol Pass,	31 23	77 55		13300
Chandídhar range,	Do.	31 16	77 56		9200
Kujean, village, Jangleg,	Bussahir.	31 18	78 1		9250
Kepu, bridge over Satlej,	British,	31 21	77 28		2800

* This pass is called the *Gunas* Pass by Capt. Herbert, (As. Res. xv. 413,) by mistake—the Gunas is another passage across the Himálaya, lying to the westward of the Rupen River.—P. G.

Temperature of Rivers, Springs, and Torrents observed.

	1819.		°
Spring between Phagao and Theog,	8th May.	7 A. M.	45,2
Stream on Klashél Range,	24th Sept.	11 A. M.	45,5
Rupen River, below Pass,	29th	9 A. M.	40,5
Satléj River, below Shipké,	15th Oct.	5 P. M.	51,3
Do. at Namghea jhúla,	22nd	9 A. M.	44,0
	1820.		
Beru Naddí or Torrent,	4th Jan.	9 A. M.	33,1
Grassu and Badí Torrents,	5th	8¼ A. M.	29,5
Chegaontí River,	9th	8½ A. M.	33,6
Pabar River, near Mandlí,	23rd Mar.	5 P. M.	52,7
Andrí near Chírgaon,	24th	7½ A. M.	43,0
Gop and Chílu Torrents,	30th	9 A. M.	43,0
Sepon River,	30th	10 A. M.	40,1
Pabar River, near Raingarh,	7th Apr.	6½ A. M.	51,8
Shillar Torrent,	20th	6 A. M.	47,0
Tons River at conflux with Pabar,	25th	7 A. M.	57,0
Shalwe River,	2nd May.	6 P. M.	69,9
Couflux of Shalwe and Kholte Rivers,	5th	7 A. M.	56,0

J. P.

V.—*Notes on the Specimens of the Kankar Formation, and on Fossil Bones collected on the Jamna. By Captain* E. Smith, *Bengal Engineers.*

[Read 26th December.]

Captain E. Smith has been engaged for some years in removing the obstructions to navigation in the river Jamna, between Allahabad and Agra. These obstructions, as is well known, consist of sandstone rocks and *kankar* banks, protruding from the bed of the river at several points, leaving, at low water, dangerous bars but partially concealed, and causing rapids and whirlpools, which have proved in years past highly destructive to boats. In the course of this important duty, of which we hope hereafter to be able to give a full account, the peculiarities of the *kankar* formation, which has been the subject of so much speculation to Indian geologists, have been strongly impressed on his observation, and he has very laudably preserved sketches and remarks of their most remarkable appearances in his note-book, which he has now submitted with the series of specimens to the Society. "They are not numerous"—he writes, "having been taken only where differences in the *kankar* and rock were evident, but they form a regular series from Agra to Allahabad, shewing the nature of the rocks occurring throughout that distance. Having little knowledge of the subject myself, I have not attempted descriptions of the specimens, which will be more correctly recognized by others, but have substituted what may be of use, viz. sketches and notes of the exact situations whence the specimens have been obtained. These even amount to little more than indica-

tions of place, for almost the remarks that have offered themselves have been reserved until I know whether they will be of service."

All geologists will agree that the graphic mode of illustration adopted by Captain SMITH is the very best for communicating at once an acquaintance with the nature of the country he has explored, and though confined to the banks and bed of a river, it must be remembered, that the section thus opened to him by the operations of nature, to a depth in some places of 100 feet or more, is a section of the great alluvium of the Doab and of the Agra plains, and not, as it would be in the lower course of the Ganges, a mere exhibition of the continually shifting channel and sands of the comparatively recent delta.—This remark extends particularly to the fossil bones discovered at Karimkhún and other places, which will be seen, as we proceed, to belong to the genuine class of fossils, underlying the *kankar* stratum of the clayey alluvium, and are not merely casual deposits in the present river, as Captain HERBERT was led to suspect when their existence was first pointed out, in a situation of the same nature, near Calpí, by Doctor DUNCAN, in 1828*.

Dr. ROYLE also brought away a fragment of bone in 1831, and expressed his opinion that fossils would be found in the banks of the Jamna, (Journal, vol. i. 457.)

Regarding the present collection of fossil bones, Captain E. SMITH's private letter furnishes the following particulars: "With the specimens of rock there is a box of fossils; I have done little more than indicate the localities, with a few remarks on the state of the bones, originating in

* See GLEANINGS IN SCIENCE, i. 23.—*Account of fossil elephant bones found in the river near Calpí.* As no further notice was taken, at the time, of Dr. DUNCAN's discovery, I take this opportunity of publishing the extract from Mr. J. LESLIE's letter which brought the subject to the notice of the Physical Class of the Asiatic Society.

"I had the pleasure of sending you on the 6th, two portions of the fossil bones of an elephant, for which I am indebted to my friend Dr. DUNCAN at Calpí; the following is an extract from his letter which accompanied them: 'The spot on which these remains were found is nearly three miles up the river on the opposite side to Calpí; at the time of visiting them there was not a long bone whole; probably a tooth might have been procured, but certainly not now, the remains being scattered by the natives who accompanied us, in all directions. I however send you what I preserved, part of a long bone (the femur) and a portion of a tusk, the lamellated structure of which is very distinct. The remains lay about 40 yards from the edge of the water, then very low, but which during the rains must evidently overflow the spot to an equal or greater extent. They appeared but superficially imbedded in the slightly coherent earthy stratum, which has been deposited by the waters on a bottom of *kankar*, of which the bed and banks of the river were here composed.'"

my acquaintance with the situations in which they are found. The portion of the subjoined note in which the fossils are assigned to different parts of the skeletons of various animals, has been derived from better authority than I can pretend to in such questions. From what has been obtained in the last year or two, it seems that fossils in great abundance are lodged in the bed of the river. They have in previous years of the works been procured in smaller quantities, from rocks or shoals differing in nature from those of the last season, having been removed in the first periods. One cause of so many having been of late discovered has been the presence of intelligent European overseers, whose curiosity has been excited by remains which were matter of indifference to the natives. It is to be regretted, however, that the attention of the men was not directed earlier to the preservation of these fossils.

"I became acquainted with their discovery in such quantities, and of such dimensions, only after an absence from the spot, during which the excavation had been completed, and could then collect merely a few of the fragments, which an interest in the subject on the part of some of the sergeants had induced them to select. Much however has been lost, and as seen in the list, a small piece only was kept of the shoulder blade of an elephant, (No. 3,) described as very perfect, but which unfortunately, with the rest of the mass removed from the shoal, was thrown into the water of a deep channel. I have lately got some more fossils, and in the course of the cold season, I shall have an opportunity of visiting some, of the existence of which in the banks of the river I have just had information, and which (if the account I have received be correct) would seem to prove that the process of petrifaction is still active."

Captain Smith has divided his notices under three heads, which we here insert in the same order, adding the characters of the rocks, and in some places their analysis, from the specimens presented to the Society.

I.—*Notes with Explanatory Sketches on a Description of Kankar found in Slabs in part of the bank of the Jamna.* (*Plate* XXIII.)

A description of flag, composed of sand coarsely but strongly cemented, in thin slabs, horizontally disposed, is found in considerable quantities at a short distance from Kárímkhán, near Oreyah, on the Jamna. The situations from which it is usually dug are shown distinctly in the accompanying sketches, with the references and notes; but the flag is not confined to the banks of the river, (Sketches 1st and 5th,) being raised as well from sand-banks far out towards the centre of the bed of the stratum.

It is excavated principally by the boat and ghat men, or the villagers of the *Mallah* class, on the immediate spot; and the search for it, and the mode of raising it, is simple.

In the hot months, when the river is low, these men observe what parts of the bank have been left by the river (Sketch 1st) so bare of sand, or deposits of mud, as to allow of a probability of the flags being reached without much labour in the removal of the superincumbent body. They are, from the excavations in former years, acquainted with the spots in which they may expect to find the flags, and the upper mass being cleared away, if the flags are reached, the excavation is carried on as long as the easy slope of the bank allows of its being profitable. It is generally from about the bottom of the bank, at the level of the lowest fall of the river in the dry months, that the flags are taken, and they are traced at all heights from this level up to 20 or 25 feet above it, but rarely or never higher. Below this lowest level, they are found in depths as great as the water has allowed of the excavation being prosecuted in, but that is not more than 4 or 5 feet. Towards the centre of the river they are raised from similar depths below the surface (Sketch 4th) from a space on which sand settles annually over a greater or less extent. Whenever any part is perceived free of sand, and the flags felt at the bottom of the water clear of that obstruction, they are detached by common iron implements, and raised. As is the case near the shore, the depths from which they are lifted do not exceed 4 or 5 feet. In raising the flags, it is usual to cut them across, (Sketch 2nd,) to reduce them to manageable dimensions, and as they are sometimes connected with each other at the edges, they are there too cut asunder. They are generally taken out in lengths of from 2 to 4 feet, the breadth varying from 1 to 2 feet.

Long round pieces are sometimes found between the flat slabs, (Sketch 3,) that is of course when the latter are not so close as to be connected. These round pieces are always smooth, never knotted, at least as those common on the surface of the kankar banks and shoals usually are. The round are always met within the horizontal line between the flat pieces, never above or below them, not even when there are double or treble strata of slabs. The directions of the lateral divisions of the slabs, as also of the grooves which channel the surfaces of both the flat and round pieces, is stated to correspond nearly with that of the present course of the river. These flags are said to harden on exposure to the air. It is unusual to find, in other parts of the bank, fine sand, similar to that of the sand strata immediately adjoining the

flags, and to that of flags themselves*. It seems to be of a kind peculiar to this bank of the river, about the lowest level. Cursory observation at least does not discover it elsewhere. It is darker and greyer, but otherwise not unlike the fine sand of the superficial beds. Flags, it is asserted by the people, are never found on the sites of former excavations, that is, they believe them to be old deposits, and have no expectation of discovering fresh formations in the spots from which they have once before raised the layers. Projecting eaves from the roofs and windows of the native pakka houses are in this neighbourhood very generally constructed with these flags. It seems to be the use to which exclusively they are applied, and they are conveyed for it to *Calpí* and other towns in the vicinity, where they are sold at a few rupees a hundred.

Similar flags to these may very possibly exist on other parts of the bank of the river, but they have never been observed or heard of except at this place, and here but in one bank of about half mile in length, and in the bed of the river opposite to it. Although, as shewn in Sketch 5, this is now the main bank of the river, it has not always been so. At some very remote period, the Jamna must have ran along the foot of the higher plain on which *Kentra* stands, and which line, with the relative distances and elevations, is seen on the small sketch.

References to the Sketches.

Sketch 1. a. Sand in strata, alternating in thicknesses of the flags.

b. Lowest level of the river.

k. Cess-pool for baling out the water.

c. First stratum of flags.

d. Intervening layer of sand, fine, of the same color and description apparently as that in the composition of the flags, varying in thickness from 6 in. to 1 feet.

e. Second stratum of flags.

f. Second intervening layer of sand.

g. Third stratum of flags.

From 1 to 5, strata of flags and intervening sand are found.

Sketch 2. The slabs in their natural position, in the sand or the river. ---- Cuts made by the people to detach them.

Sketch 3. Plan and section shewing the round pieces of kankar (*a*) found lying between the flat slabs (*b b*).

Sketch 4. The method of obtaining the kankar from the sand-beds towards the centre of the river.

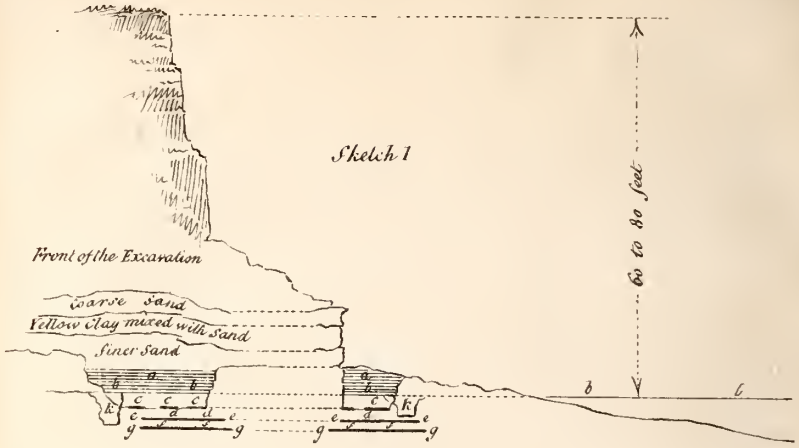
A. One of the men separating the pieces by a sharpened crow-bar.

B. Another lifting up the detached pieces from the bottom.

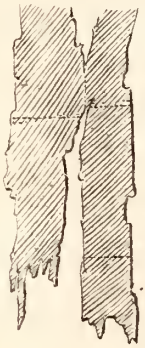
* The composition of the flag kankar analysed by me was as follows :

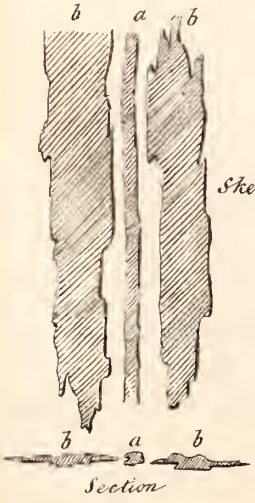
Carbonate of lime, ...	42.2
Fine sand,.....	57.8
	100

Ed.



Kankar beds of the Jumna River





Method of extracting the Kankar near the centre of the river.

Varieties of Kankar in the Banks of the Jumna

(the numbers refer to the Specimens)

Fig. 6

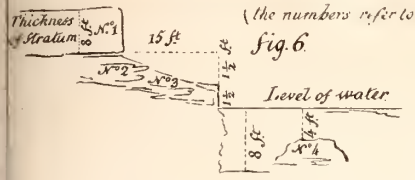


Fig. 7

Fig. 8

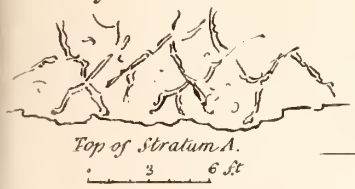


Fig. 9

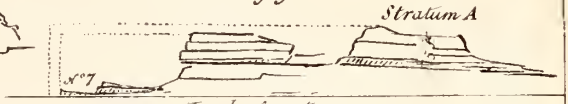


Fig. 10

Fig. 11

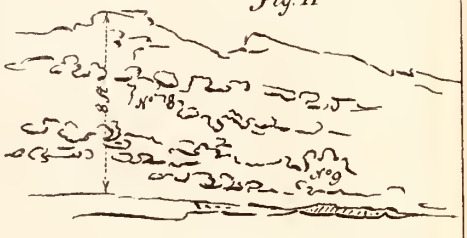


Fig. 12

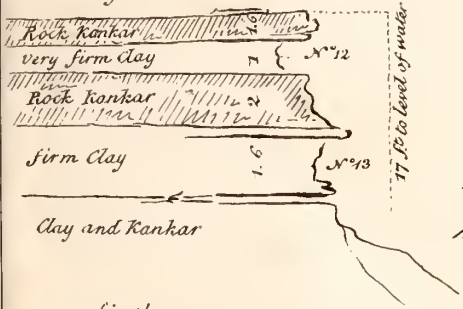


Fig. 13

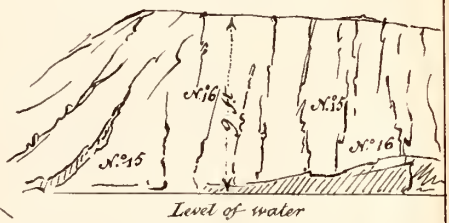


Fig. 14

Fig. 15

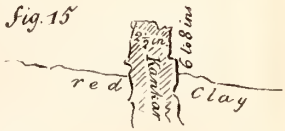


Fig. 16

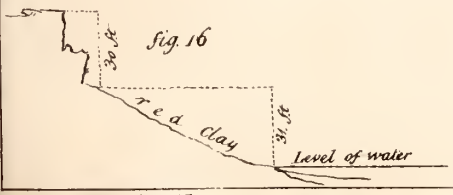
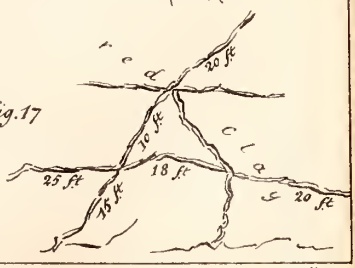


Fig. 17



Sketch 5. Plan of the locality.

a. Present bank of the river, 40 to 60 feet above the lowest level of the dry season.

b. former bank, 100 to 140 feet above ditto.

c. Bank, in, or near which the slabs are found.

2.—*Notes on Specimens of Kankar and Rock taken from the Bed of the Jamna, between Agra and Allahabad. (Plate XXIV.)*

Fig. 6—represents a section of the river bank at *Sinjaity*, above *Etáwa*, with the kankar jutting under water.

No. 1. Loose kankar gravel, cemented with clay and lime.
2. Ditto, with kankar cement: micaceous sand.
3. Botryoidal kankar.
4. Resembles 2, but more solid.

Fig. 7.—*Kaláysar*, at the junction of the *Sinde*, 20th April.

No. 5. Hard sandy kankar.
6. Stalactitic kankar, rich in lime.

Fig. 8—is a plan of the surface of stratum A in the last sketch, which much resembles the filling up of the natural cracks, formed on the drying of a clayey soil, with a carbonaceous and sandy infiltration.

Fig. 9—shews the general elevation of the specimens from *Kaláysar*. The main bank immediately above rises to the height of about 70 feet, and at a furlong further back, to a total height of 130 feet; above the kankar the bank is of fine clay.

No. 7. A concretion of rolled fragments of kankar.

Fig. 10—is a section taken at *Kanjosa*, at the junction of the *Sinde*. Here the nodular kankar lies in inclined strata in a hard clay, upon the horizontal surface of which rests a flat plate of kankar, (similar to that extracted from the bed of the Jamna ?)

Fig. 11.—*Himatpúr*, 20th April. A mass of nodules in close contact, but disposed in strata nearly horizontal; some at 12 feet above the level of the water, some at less. The kankar which has acted as a cement to the mass is seen in veins.

No. 8. Hard ramified kankar.
9. Smaller, of various forms.

At *Burlót*, below the junction of the *Chambal*, 20th April.

No. 10. White kankar in sandy clay; of this there are extensive shoals, which offered obstructions to the navigation.

No. 11. Rock kankar, a granular concrete, with marks of shells? Stratum, two feet thick, sixty feet above the lowest level of the river: total height of the precipitous bank about 100 feet.

Fig. 12.—At *Naní*, between *Calpí* and *Hamírpúr*, the measurement and nature of the strata are shewn in the sketch.

No. 12. Is a firm clay.
13. A sandy marl, effervesces with acids.

14. Rock kankar, a calcareous sandstone, containing angular fragments of silex, felspar, and yellow clay. A few strata, about one foot thick each, with strata of the usual description between, form together masses of 12 feet thick rising to 17 feet above the surface of the water.

Fig. 13.—Section of the clay bank above *Hamírpur* and below *Secrorí Ghát.* The kankar (15) here appears in vertical seams in the scarped front of the bank, which is itself of a firm clay.

No. 16. Sandy clay, with perforations—and an imbedded *unio* shell, open.

17. Ramified kankar from the bank at the level of the water, *Hamírpúr.*

Fig. 14.—Section of part of the bank at *Arroel,* below *Hamírpúr.*

No. 18. Kankar conglomerate (large rolled fragments, reunited with kankar cement).

19. Plate kankar, of botryoidal form—micaceous sand adhering: from *Takouri* near *Chiladára Ghát,* it appears combined in large rocks and reefs.

Note.—To this part of the *Jamna* the clay and kankar formation prevails. Below, fresh descriptions of rock supersede the kankar, except in the specimens distinguished as such.

20. Red vitrified clay, or *khangar,* of variegated color, from Marka. The mass is about 200 feet in dimensions, rising 20 feet above the level of the water.

21. Ditto, partially heated, found in detached lumps near the base of ditto.

Figs. 15, 16, 17.—At *Agrye,* 1st May, above *Mhow.* Veins of kankar (No. 22, clayey kankar), here run in veins through red clay, containing nodules of kankar: from the unequal wear of such materials by atmospheric influence, the veins are sometimes seen to protrude like dykes above the clay, as represented in Fig. 15, to the height of half a foot or more: the superficial appearance is reticulated, as shewn in Fig. 17.

No. 23. Plate kankar from *Kankota;*—of this kind extensive beds and reefs occur, it is much the same as that at *Pachkouri.*

The other specimens forwarded with the kankar series, are as follows:

No. 24. A calcedonic conglomerate of fused lithomarge, forming the substance of a rocky island above the *Taboda* hill, taken from the mass 25 to 40 feet above the water-level.

Specimens from *Mhow,* 40 miles above *Allahabad.*

No. 25. Sandstone from the rock about the centre of the river, at six feet above the level of the water.

26. Lithomarge, in masses, 10 feet above the water.

27. Sandstone flag, from the *Bundelkhand* bank of the river.

28. Red clay and gravel (ferruginous kankar), running in veins 30 to 40 feet in length, 3 or 4 inches thick, taken from the same spot as No. 27.

29. Friable white sandstone, from about the centre of the river, near the lower part of the pass, forming large reefs and masses, 3 or 4 feet above the water-level.

30. Sandstone, fine grained, from a large mass about the centre of the river, in the higher part of the pass, taken from 3 or 4 feet above the level of the water.

Specimens from the great reef at *Bamiárí*.

31. Hard sandstone, 6 to 10 feet above the level.

32. Kankar, in very small quantities, found near the above.

Unless specified otherwise, it should be understood, that by the "level of the water," in the preceding notes, is meant every where the lowest annual level of the river.

Small springs, flowing in free through scanty streams, run from under many of the ledges of kankar on the banks of the river. They are rarely met with except in these situations, and in the possibility of their being still impregnated with the calcareous matter which seems to have been the principal agent in the formation of the kankar, some of the water has been brought off in bottles,—a rude attempt made here to discover the presence of lime was not successful in detecting it*.

3.—*List of Fossil bones found in various situations in the prosecution of the Jumna works at Karimkhán*, 1833.

The numbers refer to the specimens presented to the Society, and to the figures in plate XXV.

1. A tooth supposed to have belonged to an elephant, 14 or 15 years old.

2. The bony or inner part of an elephant's tusk.

3. The extreme point of an elephant's shoulder-blade; the remaining part of the bone weighed about $1\frac{1}{2}$ maunds.

4. A portion of an elephant's shin-bone.

5. Portions of the back-bone of a camel, (?) or one of the vertebræ of the lower part of the neck.

6. Knuckle bone of the knee-joint of ditto.

7. That part of the shin-bone nearest the fetlock joint of ditto, or end of the shank-bone next the knee.

8. Portion of a rib of ditto.

* Both of these waters were found to be nearly pure, their specific gravity being sensibly the same as that of distilled water. On applying the proper tests, the only salt discovered in the water from *Naní* was carbonate of lime; that from *Arroel* contained the same, with a very slight admixture of muriate of soda. The slight solution of carbonate of lime may have been rather derived from the kankar, than have aided in producing it.—Ed.

9. Portions of human bones, (?) the two black ones being the head of the thigh-bone and head of the arm-bone.

10. Two pieces supposed to have been parts of alligators.

11. Portions of bones belonging to the skeletons of horses, buffaloes, &c.

12. The upper part of the leg-bone nearest the shoulder of a young elephant, or the lower part of the thigh-bone of the same animal.

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1 and 2 were taken out of a mixture of sand and kankar, partially exposed to the atmosphere.

3, 4, 8, 9, 10 and 11, were all procured on sloping the banks of a channel, the sides of which are from 1 to 5 feet above the lowest level of the river (the bank being 50 feet high.) They were dug from depths of from 6 to 18 inches in the firm shoal, which is composed of substances, kankar stone, gravel, rounded bricks (vitrified clay ?) more or less rolled and cemented by mud and clay.

5. Were dug out of a cleft in hard yellow clay about 9 inches deep, filled with black mud, about 3 feet from the surface of the water.

6. Were found in the bed of the river about 18 inches deep, and 4 feet from the surface of the water, during the excavation of a bund.

12—was found on the left shore of the *Jamna*, at *Choura*, above *Calpí*, partially imbedded in a clay and kanker bank: all the rest were dug up at *Karimkhán.*

Of the fossil bones those found in the shoals of kankar were the least perfect, the petrifaction being less complete, or the fossil in inferior preservation. In the stiff clay, which composes a considerable portion of the bed of the river here, the fossils were in better order. This difference may be accounted for on various suppositions. The fossils, after being washed from the spots where they became such, might have been better preserved in the stiff clay than in the loose shoals; or the change into the fossil state may have taken place in the immediate neighbourhood of the clay, and those found in the loose shoals have been carried by the water from the original place of formation, having suffered injury in their progress from their first to the new situation in which they are found.

It is difficult to assign to these remains the dates of their passing into the fossil state. The greater number have been found in an extensive shoal, of partially rolled kankar, cemented by mud, and which from known changes in the river might be of very recent accumulation. A large proportion of the fossils seem to have had a former situation in the hard clay of the bed of the river, however carried thence to the

kankar shoal. But whether they become fossils in the clay, or whether, after becoming so in other spots, they were swept on, till lodged in the clefts of the clay, still remains a point to be ascertained.

There is a probability in the former supposition, from the fossils found in clay being coloured throughout with its yellow tinge, whilst those dug up from gravel or kankar are of the greyish hue of these latter substances. If then the fossils are of the dates of the masses in which they were discovered, their age must be considerable, for the clay spoken of lies at great depth in the plain of the *Doab*, and must be a very early deposit.

In regard to fossils—will substances, after having completed their change to that state in some other spot, acquire throughout their internal structure the color of clays, in the clefts of which, after travelling from a distance, they may have found a fresh resting place? If they will, the difference of color in the fossils leads to no evident conclusion on the preceding surmises. One curious particular seems established after repeated inquiries. The fossils marked 5 were taken out of clefts in clay which lay below a thick stratum of rock kankar. Still it is far from certain that the rock kankar was so entire, so free from fissures, as to permit of no other explanation than that of the fossils having been deposited or changed in the clay, before the formation of the kankar which rested in it. That clay is itself of great age, it is at the bottom of the river, 40 feet from the extreme height of the rise of the river in the rains, and from 100 to 150 below the plain of the *Doab* and *Bundelkhand*."

To these guarded remarks of Captain E. Smith, every attention is due, and he deserves our best thanks for so impartially laying the circumstances of the *Jamna* fossils before us. It would seem to be pretty well established from his local observations, that many if not all of the fossils were first deposited in the clay stratum from 100 to 150 feet below the plain of the *Doáb*, and under the general line of the kankar formation; that upon the excavation of the present bed of the *Jamna*, many have been washed out of their original seats and removed to clefts in the ledges of rock in the bed of the river, and have been there mixed up with a fresher muddy deposit, and in some cases impregnated with a tint therefrom. That they belong to the former period, and that the kankar attached to them is also much more ancient than the present sands of the river, is rendered sufficiently evident in some of the specimens by the large angular quartz and felspar gravel, cemented on to many of the bones. Some angular pebbles of

quartz are here and there perceived also in the concretions of rolled kankar; and it is a curious fact, that the size and description of the granitic gravel adhering to the bones, exactly resemble the characters of those attached to the *Jabalpur* fossils.

With regard to the human bones (No. 9), much doubt may fairly be entertained, on account both of the imperfect preservation of the fragments and the rarity of their occurrence in a fossil state: indeed, it is well known to be a much contested point whether the bones of man, or those of the monkey tribe, have ever been so discovered; although the careful examination of the human remains lately found in the caves of the south of France seem to have set the point at rest with most of the French geologists.

As the Annales de Chimie*, in which M. Tournal sets forth his opinions, is rarely to be met with in India, and as the animal remains inhumed in the mud and gravel of caves may prove hereafter to be contemporaneous, geologically speaking, with our newly-discovered deposits under the clays of the *Doáb*, we shall make no apology for concluding our present notice with a brief sketch of M. Tournal's view on this interesting subject.

Occurrence of the Bones of Man in the Fossil State.

The phenomena of caves is much more complicated than was at first supposed, when the simple theory of a diluvial wave washing into them the debris of animals on the instant of their sudden destruction was proposed as sufficient to account for the quantity of bones found imbedded in the mud, gravel, and stalagmite of these truly valuable geological depositories.

Of the vast number of caves lately brought to light on the continent of Europe, some have been found to contain no fossils; others merely gravel and mud;—some, ancient bones and coprolite; and others only a prodigious quantity of the recent dung of bats and birds of prey. No general law pertains to them. They occur at all heights;—in calcareous rocks of every different age, and at various elevations above the present contiguous valleys. Such as are found in inaccessible situations, and at a distance from running water, are generally empty; those of which the apertures have been but recently disclosed by gradual wear of the rock in front, contain only modern deposits; the nature of the organic remains varying according to the locality and the antiquity of the aperture. In some cases we meet exclusively with the bones of a species of large bear *(ursus spelæus)*, the skeletons of which are still in connection, and appear to have been gradually imbed-

* Annales de Chimie, Fevrier, 1833.

Fossil bones from the bed of the Jumna River, collected by Capt^n E. Smith, Eng.

N°1.

Nos 13 14 & 15 from Lieut Burts Collection

ded and thus perfectly preserved. In others, like Kirkdale, the mass consists of a multitude of bones, half gnawed and rounded, among which is remarked a quantity of hyænas' dung (coprolite); in others a narrow crevice is filled with skeletons of the smaller carnivorous animals and birds. The formation in all these cases is natural and evident: the habits of bears and hyænas of the present day accord exactly with what we see to have been their practice in ages past: the caves were the residence of these animals for generations, and were by no means filled by any brisk transient or universal wave of transport: and there is no ground deducible from them for the separation of organic remains into the two classes of *ante* and *post*-diluvian.

The soil of these caverns generally has a strictly local origin, and may be identified with the debris of the neighbouring mountains. In most cases it can be proved to have been gradually introduced from some opening above, and not from apertures fronting the present valleys, which have in most cases been laid bare by the subsequent denudation of the channel of the present rivers, when the level of the ocean subsided: the strata of soil can be divided into the finest laminæ, and very often thick strata of stalagmite separate one bed of soil, and its contents, from the next.

Having proved that the fossil caves vary in their contents from local circumstances, and that they have been filled in very long periods, M. Tournal comes to the important question, whether the cave deposit ever contains human bones, or pottery and works of human art; and, if so, whether these objects appear to be coeval with the other matter of the caves; in fact, whether man was or was not contemporaneous with animals now considered to be extinct, and, as it were, belonging to a former creation.

Human remains had been long since observed both in what was called diluvial clay, and in the soil of caves; but their presence was deemed accidental, and it became a dogma of the science that man existed not in a fossil state. The recent discovery however of the caverns of Aude, Herault, and Gard exposed a vast magazine of human bones and antique pottery inclosed in the self-same matrix with the hyæna, lion, tiger, stag, and numerous other animals, *all of extinct species*. Attention was thus once more awakened to the subject, and MM. De Serres, Christol, and Tournal, after an attentive and conscientious examination, have come to the conclusion that all these objects, are of the same date; whence it results that man was the companion of animals now considered extinct and fossil. The grounds of their opinion are;—

the equal change which the bones have undergone : their mode of deposit : the variety of species in some of the animals, which denotes domesticity ; and the occurrence of extinct species bearing the marks of cutting instruments. The problem being thus resolved, it follows that man must also be included among the fossil species, or rather that the sudden transition from one condition of being to another must be disallowed, and that the same gradual alteration of species, already so fully developed by M. Deshayes in his comparison of the fossil shells of the different periods of the tertiary formations, must be extended to animals, and perchance to man himself : that, in fact, the barrier of fossil and non-fossil must henceforth be a distinction of convenience only, to separate such remains as may be found buried in the regular geological strata, from those of more modern or accidental inhumation.

M. Desnoyers however suggests that these bones may be comparatively modern, and that they may belong to the primitive Gauls, who lived in caverns. This opinion accords well enough with the circumstances of the cavern at *Miallet*, in which M. Teissier found little figures, fragments of jars, bracelets, &c. but it will not at all apply to the other localities described, and in which the mixture of bones is so decided.

Great light is thrown by these discoveries on the before ill-explained fact of the occurrence of human bones in the breccias of Cagliari, Nice, Gibraltar, and Tripoli, which contain marine shells, and seem to prove that the level of the sea was once 150 feet higher than at present : the caves generally betoken an equal height of the running streams which are supposed to have gradually silted up the caverns.

The shell deposit of Cape St. Hospice, near Nice, also contains broken pottery, and the same has been observed in the bone-breccias of Dalmatia and Syria, which contain human bones, as does the ossiferous sand of Bades near Vienna.

M. Boue' rightly observes that such facts are of too frequent occurrence to allow of explanation on the ground of any accidental introduction during the period to which history extends. They all testify a lowering of the ocean level with respect to the land, caused by the upheavement of the latter, and thus render it evident, that these changes have been in action subsequent to the existence of man on the globe.

M. Tournal and other French naturalists, further suppose that several races of men have successively had possession of our continents. The form of the skulls found at Vienna is stated to approach to the African or Negro type. Those discovered in the fluviatile marl of the valley of the Rhine and Danube exhibit a close resemblance to the heads of the Karaibs or those of the ancient inhabitants of Peru and Chili. It

is of course in vain to seek in the most ancient histories of these countries for any tradition of the violent commotions which the crust of the earth has endured (as is now proved), since man became its tenant. Geology alone can seek to unravel the general facts in an uncertain thread of events, through the gradual development of the records carefully treasured in caves and strata, and written in actual symbols of life of less equivocal interpretation than Egyptian hieroglyphics. But the subject is yet new, the facts limited, and we must be cautioned against coming to any conclusions without the most mature and impartial examination. It is to this philosophic caution perhaps that we must attribute the silence of Mr. Conybeare on so interesting a topic, in his report on geology to the British Association in 1832. After alluding to Professor Buckland's acute observatioms on the numerous bone caverns of England and Germany, "which have thrown so much light on the particulars of the history of so many long-extinct races of animals, and proved beyond a doubt that they were originally the inhabitants of the districts where their remains are now found;" he briefly adds, "but still on many questions connected with this curious and interesting subject, especially the relative age of the human bones occasionally found in the same cavern (as at Bize in the South of France), we are bound to compare the opposite views of De Serres, Christol, and Tournal, with those of Buckland, with whom however Desnoyers appears entirely to agree."

The last edition of Dela Beche's manual also barely alludes to the fact of human bones having been lately found in the same mass with the remains of the extinct rhinoceros and other animals usually discovered in caverns.

We have dwelt at some length on this novel subject, in hopes of drawing the attention of our Indian geologists more zealously to prosecute their investigation of the new field of organic remains now opened to their labours in the clay of the *Doáb* and the banks of the *Jamna*. Should it be proved that the bones of man are there really imbedded, and that the animals found with him are (like the elephant of *Jabalpur*) of the existing Asiatic species, it will form a strong and very important link of connection between the state of things at two distant epochs of our globe, now distinguished as the recent and the fossil periods.

In digging wells in the *Doáb*, or in any part of the upper Gangetic plain, the search for fossil bones at considerable depths should not be neglected, even under the strata of kankar, which occur almost every where in the yellow clay. We might not despair even of finding bones at the lowermost depth to which we have bored in Calcutta, for the yellow clay under the blue alluvial beds contains kankar, and is of the same apparent age as that of the *Doáb*. J. P.

VI.—*Further particulars of the Earthquake in Nepal. By* A. Campbell, *Esq. Assistant Surgeon attached to the Residency.*

In pursuance of the attempt made before to note the destructive effects of the earthquake of the 26th August last, throughout the valley of Nepal, and its immediate neighbourhood, and with the hope of shewing, as correctly as my information will permit, the probable seat or central point of the commotion, I beg to offer the following memoranda of other places at which the shock was experienced, as well as its comparative degree of intensity at each.

The means of estimating the violence of this phenomenon are of course most defective, if not wholly inadequate to the purpose; but in absence of better data, the ascertained amount of damage done to the frail and perishable works of man, may be received as an index of its intensity at one place, compared with that of another, and in conformity to this mode, it would appear, that the most extreme violence of the shock, as far as its occurrence is as yet known, was expended within a tract of country extending from this side of the great Himálayan range on the north, to the course of the Ganges on the south, and from the *Arún* river (in the Nepal hills) on the east, to the western branches of the *Trisúl Ganga* on the west, comprising a space of about 200 miles from north to south, and 150 from east to west. In this space, the valley of Nepal, though not geographically the centre point, is most assuredly the portion that has suffered the greatest violence of the calamity; and, unless the inexplicable producing causes have been expended in the frequent and severe shocks that have to this day continued to recur, we may from our experience of the progress of earthquakes in other parts of the world, with reason, as we ought with resignation, look forward to further and more violent exhibitions of the same terrible nature.

In the notice of the earthquake by the Secretary of the Asiatic Society, in his Journal for August, he expressed a belief, that the greatest intensity of the shock would be found to have occured beyond the Himálaya, in the direction of *Lassa;* and judging by the direction from which the shock was felt to have proceeded, and its intensity in the valley of Nepal, such was the probability, though other has turned out to be the fact, and that upon good authority.

The recent return from Pekin of an Embassy from Nepal, to the court of the Celestial Emperor, has furnished authentic information on this subject, which otherwise might have been long wanting; and the whole tenor of it shews that the great Himálayan range itself, and the country

on *this* side of it, was alone the theatre of the earthquake's presence, and that it was not even in the slightest degree felt beyond a very short distance on the Tibetan side of those huge mountains. The Embassy was at *Lassa*, on the 26th of August, when and where the shock was not experienced. At *Digarchi*, in the following month, it first received accounts of its occurrence from Nepal; to the inhabitants of that place the circumstance was known only from reports brought from this side of the mountains; along the road from *Digarchi*, the answer to all inquiries was the same, "No earthquake on the 26th of August," and not until its arrival at *Tingrí* was it found that the shock had been felt. *Tingrí* is a small Chinese post, immediately beyond the great Himálaya, and the first stage on the table land (as it is called) of Tibet, going from hence to *Lassa*, (by the *Kúti* or eastern pass from the valley of Nepal.) From *Tingrí* to *Kírung*, a distance of 8 or 10 marches, the route is nearly due west, running along; and through the northern side of the Himalaya, and throughout this tract, though but thinly inhabited, authentic reports of the occurrence of the shock were received. By *Kírung* (the eastern pass from the valley into Bhote), the Mission penetrated the great range, and at each stage (four in number through the pass), intelligence of the occurrence was communicated by the few individuals who inhabit that wild and sterile region. But such information was not required, as its effects were sufficiently manifest: in the village of *Kírung* itself, supposed to contain 400 houses, 60 were fairly demolished, and many more seriously injured: two men had been killed under the ruins of their houses, and about a dozen wounded. From the exit of the pass to *Kathmandú* there are no towns along the route, and scarcely any villages; but at many places, insulated houses of the mountaineers had been thrown down, and the precipitous banks of hills and mountains had been hurled into the subjacent valleys.

This shews the extent of damage done towards the north, and enables us to fix upon the line of *Tingrí* (Lat. 28°) as the northern limit, of the earthquake's presence, and reports would shew that of *Jabalpúr* and *Calcutta* to have been the southern one. *Rangpúr** defines the east and Dehli the west.

North-east from *Kathmandú*, as far as *Dúlka* and *Kúti*, the violence of the shock would seem to have been greater than in the valley. West from *Kathmandú* it diminished at every step. At *Gorkha*, only two houses were destroyed; at *Palpa*, none; and at *Dotí*, on the borders of *Kemaon*, the shock was felt, but not by any means severely. It will

* Mr. WALTERS informs me that it was also felt at Chittagong.—ED.

be easily broken off, clearly shews how little the abrasion must have been. That however their present site is not their original one, seems now to be further confirmed by the discovery of a bed of fossil shells (univalves reversed), only distant about half a mile, and apparently in a continuation of the same limestone bed as that on which these palm-trees lie*. In the one case, however, the calcareous formation forms the surface soil, whereas in the latter it is covered by 17 feet of hard and soft basalt.

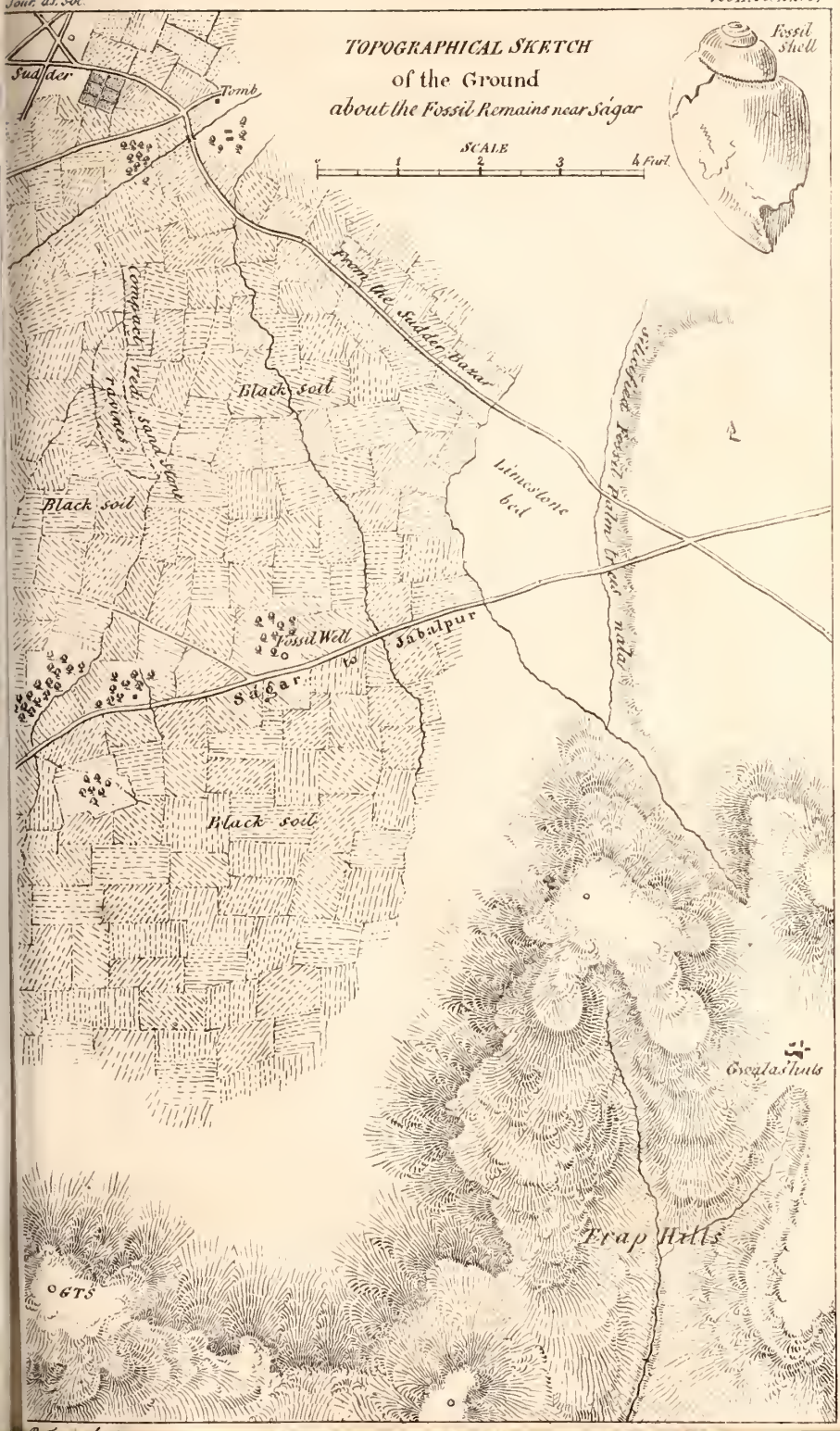
The discovery of these shells was made, as discoveries of the kind usually are, by accident, at the foot of the trap hills beside which the Jabalpúr road runs; a well had been dug some 14 years ago, and with the stones turned out of it a small hut had been erected. It was in a lump of the out-turned limestone deposit (travertine), a large shell was observed, and inquiry discovered the original locale of it to have been the centre of the well; the sides of the well had been built up with red sandstone, and it was necessary to sink a shaft beside it to get at an accurate knowledge of the site. I caused specimens of the different strata to be preserved, at the same time noting their depth respectively: a sample of each stratum, as well as specimens of the fossils, I have had the pleasure of forwarding for the museum of the Society. I am unable satisfactorily to determine whether the shells are of marine or terrestrial origin. The opinion here is that they are marine: a striking peculiarity in them is that they are all reversed, and some are much more flattened than others.

The surface soil, (No. 1) as well as Nos. 2, 3 and 4, are well marked, and the transition from one to the other is as abrupt and sudden as the specimens furnished. No. 5 is not so well marked. I have called it wacke. It pervades as a sub-soil a large portion of the trap soil about *Ságar*. A coarse analysis which I made of some from a well about a mile from the fossil well, gave me

Specific Gravity, 3,600.

200 parts,	Loss by drying,.....	34
	Magnesia,.....	18
	Alumina,.....	14
	Peroxyde iron,.....	30
	Siliceous sand,.....	100
	Loss,.....	4
		200

* The annexed topographical sketch (Plate XXVI), which I am enabled to furnish through the kindness of Capt. Macdonald, of the trigonometrical survey, will convey a better idea of the locale of the two sites than any written description.


TOPOGRAPHICAL SKETCH
of the Ground
about the Fossil Remains near Ságar
SCALE
1 2 3 4 Furl.
Fossil shell
Sudder
Tomb
From the Sudder Bazar
Compact red sand stone
ravines
Black soil
Black soil
Limestone bed
Fossil Well
Jabalpur
Sagar
Black soil
Excavations
Trap Hills
GTS

When first dug out it is friable and has a very gritty feel, falling abroad on being thrown into water like lime when it is slaking. In the sample I have sent I find several minute nodules of carbonate of lime, which will of course alter the results as given above. No. 7 is a coarse silicious grit, and No. 8 is basalt again. Beyond which I did not consider it necessary to extend my search.

I do not venture to offer any hypothesis on the discovery of the above interesting facts, but content myself by bringing to the notice of the members of the Asiatic Society of Calcutta the singular circumstance of shells in a high state of preservation lodged in a calcareous bed, being found in the midst of volcanic matter. I hope some day to be able to ascertain the limits of the fossil beds.

The following is a section of the shaft:

1. Surface soil, black, 3 feet.
2. Soft basalt, $2\frac{1}{2}$ do.
3. Hard basalt, 7 do.
4. Soft basalt, $1\frac{1}{2}$ do.
5. Wacke with nodules of limestone, 3 do.
6. Travertine with imbedded shells, $1\frac{1}{3}$ do.
7. Coarse silicious grit, 2 do.
8. Hard basalt.

VIII.—*Meteorological Register at Barelly, in* 1831. *By* H. S. Boulderson, *Esq.*

May.		*Bar.* 32°	*T. A.*	*M. B.*
8	3 P. M. .	28.914	102	....
11	5 P. M. .	.739	106	73
12	$7\frac{1}{2}$ A. M. .	.836	81	66
	3 50 P. M.	.803	105	74
13	Noon	.908	98	75
	2 40 P. M.	.857	99	75
14	6 A. M. .	.844	83	70
	$9\frac{1}{2}$ A. M. .	.889	92	74
	$5\frac{1}{2}$ P. M. .	.820	102	75
	10 P. M. .	.851	92	75
15	$6\frac{1}{2}$ A. M. .	.893	84	$69\frac{1}{2}$
	9 A. M. .	.935	91	73
	Noon	.921	98	75
	$3\frac{1}{2}$ P. M. .	.858	$103\frac{1}{2}$	76
	$5\frac{1}{2}$ P. M. .	.830	102	76
16	$7\frac{1}{2}$ A. M. .	.972	89	73
	10 A. M. .	.965	96	77
	Noon	.965	100	77
	4 P. M. .	.905	102	77
	Sunset	.886	100	76
17	$6\frac{1}{2}$ A. M. .	.914	86	72
17	Noon	28.930	100	76
	Sunset.....	.815	100	75
	10 P. M. .	.850	94	73
18	6 A. M. .	.833	78	63
	9 A. M. .	.847	91	73
	2 P. M. .	.791	103	72
	4 20 P. M.	.756	104	74
19	7 A. M. .	.814	92	71
	$9\frac{1}{2}$ A. M. .	.848	98	76
	Noon	.814	102	77
	3 P. M. .	.752	104	76
20	$9\frac{1}{2}$ A. M. .	.894	95	75
	3 P. M. .	.834	103	75
	Sunset	.815	101	75
21	6 A. M. .	.846	81	65
	9 A. M. .	.880	93	73
	4 P. M. .	.823	104	75
	Sunset	.838	100	$74\frac{1}{2}$
	12 P. M. .	.853	90	68
22	7 A. M. .	.878	88	70
	9 A. M, .	.921	92	73

May.		Bar. 32°	T. A.	M. B.
22	Noon	28.903	99	74
	4 P. M. .	.821	103	76
23	6 A. M. .	.913	82	68
	9 A. M. .	.961	91	72
	3 P. M. .	.886	102	77
	6 P. M. .	.851	100	76
	11 P. M. .	.882	91	74
24	7 A. M. .	.924	84	72
	9 A. M. .	.968	93	75
	4 P. M. .	.876	102	76½
25	7 A. M. .	.960	84	73
	Noon	.978	102	75
	Sunset	.880	100	75
26	6 A. M. .	.961	84	74
	Noon	.996	101	78
	Sunset	.894	100	75
27	7 A. M. .	.971	88	74
	9 A. M. .	.976	94	75½
	Noon	.940	102	78
	3 P. M. .	.898	104	78
	5 P. M. .	.858	104	77
	10 P. M. .	.860	97	76
28	6 A. M. .	.900	85	73
	9 A. M. .	.928	94	77
	Noon	.898	102	79
	11 P. M. .	.852	92	71
29	7 A. M. .	.855	88	70
	9 A. M. .	.888	94	73
	7 P. M. .	.794	100	74
	10 P. M. .	.828	95	71
30	7 A. M. .	.847	88	71
	2 P. M. .	.806	102	77½
	Sunset	.755	101	76
31	7 A. M. .	.844	90	78
	10½ A. M. .	.845	97	79½
	Noon	.745	101	79
	Sunset	.666	100	79
	11 P. M. .	.680	93½	78
June, 1831.				
1	7 A. M. .	28.736	89	76
	10 A. M. .	.851	94½	79½
	Noon	.742	98	80
	2 30 P. M. .	.667	102	80
	4 P. M. .	.634	103	79½
	6 P. M. .	.581	102	78
	8 P. M. .	.597	98	78
	11 P. M. .	.615	96	78
2	7 A. M. .	.712	91	80
	10 A. M. .	.758	95	82
	3½ P. M. .	.660	101	82
	6 P. M. .	.612	101	81
	10½ P. M. .	.343	96	78
3	6 A. M. .	.769	88	79
	9 A. M. .	.808	92	80
	Noon	.807	98	81
	2 P. M. .	.751	100	82
	3½ P. M. .	.709	100	82

June, 1831.		Bar. 32°	T. A.	M. B.
3	7 P. M. .	28.652	98	81½
	10½ P. M. .	.673	96	82
4	7½ A. M. .	.779	92	82
	9½ A. M. .	.797	94	82
	1 P. M. .	.777	100	84
	Sunset	.677	100	82
5	8 A. M. .	.839	92	82
	Sunset	.721	100	83
	10½ P. M. .	.725	97	82
6	6½ A. M. .	.823	90	80
	10 A. M. .	.841	94	82
	3½ P. M. .	.727	100	83½
	Sunset	.557	99	82
	10½ P. M. .	.743	94	81½
7	7 A. M. .	.805	91	80
	9 A. M. .	.857	90	80½
	4 P. M. .	.757	97	82
	Sunset	.773	91	82
	10 P. M. .	.835	87	78
8	7½ A. M. .	.899	87	79
	10 A. M. .	.904	93	80½
	Sunset	.768	94	83
	10 P. M. .	.829	92	81
9	7½ A. M. .	.926	81	75
	10 A. M. .	.935	81½	76
	4 P. M. .	.865	90	80
14	8 A. M. .	.884	89	81
	Noon	.891	91	82
	1½ P. M. .	.858	91	82
	4 P. M. .	.804	90½	81
	Sunset	.800	90	80½
	9½ P. M. .	.802	88	82
15	7 A. M. .	.803	86	82½
	9 A. M. .	.819	88½	82½
	3 P. M. .	.707	95	81
	10½ P. M. .	.732	91	81½
16	7½ A. M. .	.755	90	82
	2½ P. M. .	.692	98	82½
	Sunset	.647	97	83
	11½ P. M. .	.725	92	82
17	7½ A. M. .	.766	91	81
	9 A. M. .	.768	93½	82
	2 P. M. .	.724	98½	83
	10½ P. M. .	.709	94	82
18	7½ A. M. .	.729	92	83
	11 A. M. .	.735	96	83
	1½ P. M. .	.705	100	82
	3 P. M. .	.675	101	82
	Sunset	.657	98	82
	9 40 P. M.	.713	95	82
19	7 A. M. .	.787	89	81
	9 A. M. .	.822	89	82
	Noon	.801	94	83
	3 P. M. .	.721	96	83
20	8 A. M. .	.805	87	82
	2 P. M. .	.777	90	82½
	12 P. M. .	.782	87	82

June, 1831.		*Bar.* 32°	*T. A.*	*M. B.*
21	7½ A. M. .	28.805	86½	81½
	10 A. M. .	.843	88	82½
	Sunset	.734	88	81
	11 P. M. .	.819	86½	82½
22	6½ A. M. .	.833	86½	82
	Noon	.819	95	82½
	Sunset	.761	94	82½
	10 P. M. .	.810	91	82
23	7½ A. M. .	.817	87	81½
	9 A. M. .	.834	90½	82
	2 P. M. .	.791	95	82½
	10½ P. M. .	.830	85½	81½
24	5 40 A. M.	.765	84	80½
	9 A. M. .	.778	85	82
	Sunset	.673	88	83½
	10 P. M. .	.725	86	84
25	7½ A. M. .	.707	86½	84
	9½ A. M. .	.727	87	84
25	2½ P. M. .	28.684	87	84
	10½ P. M. .	.713	85½	83
26	7 A. M. .	.767	79	79
	9½ A. M. .	.825	80	80
	Noon	.825	82	80
	Sunset	.813	82½	80
	9½ P. M. .	.812	82	81
27	5½ A. M. .	.813	81	80
	9½ A. M. .	.844	84	81½
	Sunset	.758	86	82
	11 P. M. .	.794	82	80
28	7½ A. M. .	.806	82	80½
	Sunset	.683	89	84
29	8 A. M. .	.759	84	81½
	Sunset	.758	78	77
	10 P. M. .	.794	82	81½
30	7 A. M .	.839	82	80
	9 A. M. .	.859	81	80

The detached thermometer was in an open northern verandah, the moistened bulb thermometer was inside the house. The barometer was a plain tube with brass scale. The barometer tube was filled with unboiled mercury, and the air gathered and extracted by repeatedly reversing it. In the "GLEANINGS," for October, 1831, I mentioned the altitude of Barelly, gained from a few observations, as about 1080 feet. I was surprised at the result myself, but could not account for it. I think I must have made some mistake in recording the observations, or perhaps in adjusting the scale to the tube. The barometer with which the above observations were made was precisely similar to the former one, but not the same. A set* of 10 observations in May, compared with those of the corresponding times in Calcutta, gives altitude of Barelly, feet 742.29. Another set of 10 observations in the same month, feet 745.58; a 3rd set of 10 in the same month, feet 730.32, and a 4th set of 10 gives feet 755.4, and a set of 31 observations in June gives, feet 753.35. With the former tube and scale, a set of eight observations in May, 1830, gave the altitude of the "oaks" at Masuri, 6796 feet above Calcutta; with the same barometer in November, the same

* 1st set of 10	Calcutta Barometer	29.617	Thermometer 92.94
	Bareilly	28.891	98.15
2nd ditto	Calcutta	29.560	92.49
	Bareilly	28.833	99.7
3rd ditto	Calcutta	29.599	93.67
	Bareilly	28.885	97.5
4th ditto	Calcutta	29.663	93.7
	Bareilly	28.924	98.7
5th ditto	Calcutta	29.487	89.9
	Bareilly	28.746	92.5

year, 15 observations gave the altitude, feet 6777.7, and another set of 10 made it, feet 6775.1, and then the latter were taken after a long march in the hills, during which the barometer had been repeatedly refilled. I have a barometer made by Bate, on the principle of Guy Sussac's syphon barometer, with Captain Kater's improvements, (that is the description given of it,) and it *seems* in excellent order. This stands about .05 higher than a barometer of the above simple make, and filled in the same easy manner as above mentioned. (I should mention that the tubes used have all been of large bore.) But I have no means of discovering the error of either.

The following observations were made at Hardwar, near the centre of the pass, in a house about 150 feet above the bed of the Ganges :

		Bar. 32°.	*Ther.*	
1833, May 24,	7¾ A. M.	28.216	84	at 10 P. M. suddenly came a cool
	9 20 A. M.	.236	96	breeze and reduced the Ther. to 91.
	Noon ..	.224	100	
	2 P. M.	.182	106	
	4 P. M.	.103	104	
	Sunset ..	.107	99	
	9½ P. M.	.119	98	
„ 25,	Sunrise..	.153	75	
	7 A. M.	.220	83	
	9 A. M.	.227	94	
	Noon ..	.219	102	
	2 P. M.	.187	106	

The height deduced from comparison with corresponding altitudes in Calcutta is, from those in the Journal*, 1214 feet above Calcutta, and from those at the Surveyor General's Office, 1276 do.

The latter are more numerous. The mean of these would be about 1245 feet, and if the estimated altitude above the river be deducted, it would leave the height of the Ganges at Hardwar above Calcutta about 1095 feet. The barometer used was, as before, a plain tube, freshly filled with mercury. Though not tried, I suppose the depression of the moist bulb thermometer must have been near 3 0.

In elucidation of the remarks on filling barometers when the air is damp, (vide Journal of the As. Soc. ii. 260.) I may record the following experiments made by myself:

On the 12th July last, when the depression of the moist bulb thermometer was 9½°, I filled a tube which stood exactly the same as one filled on the 3rd June, when the air was very dry ; in both these tubes

* My barometer stands on an average .044 lower than the Surveyor General's, which will make an addition of 50 feet necessary to the altitude calculated.—Ed.

the mercury stood about inch .05 lower than that in the English barometer above mentioned.

On the 1st August, I emptied the tube which had been filled on the 3rd June; and refilled it: the results of this and a few more experiments I give below:

1833.		Thermometers.				
1st Aug.	*Eng. Bar.*	*Altd.*	*Detd.*	*M. B.*	*Plain tube.*	
4 P. M.	28.684	86½	87	83½	28.594	tube fresh filled.
5 P. M.	.666	do.	do.	do.	.412	tube again filled after remaining empty an hour.
					.374	tube again filled.
					.564	tube wiped out and filled.
6 P. M.	.672	86½	85	83⅓	.552	ditto ditto.
					.626	tube wiped out very carefully.

The tube was wiped with an iron wire, round which silk was bound for about six inches, and on the last occasion, I heated the silk over a fire, and kept up a smart friction in the tube, till I felt a sensible heat from it. I should think that similar results might always be gained. The height at which the mercury stood, after this method of drying the tube, being the same as regards the English barometer as what it was when it was filled in very dry weather on the 3rd June.

IX.—*Proceedings of the Asiatic Society.*

Wednesday Evening, the 26th December, 1833.

Captain W. N. Forbes, Engineers, in the Chair.

The Proceedings of the last Meeting were read.—G. A. Bushby, Esq. proposed at the last Meeting, was elected a Member.

A. Hamilton, M. D. Surgeon of H. M. 41st Regiment of Foot, at Moulmein, was proposed as a Member by Mr. Twining, seconded by Mr. Prinsep.

Messrs. Mackenzie, J. S. Stopford, and Mr. A. Beattie, proposed by Mr. Bagshaw, seconded by Dr. Tytler.

A letter was read from M. J. J. Marcel, Ancien Directeur de l'Imprimerie Royale, Membre de la Commission d'Egypte, &c. requesting to know the result of his application of the 14th July, 1830, and presenting copies of his Translations from the Arabic.

Mr. Marcel was elected an Honorary Member on the 4th January, 1832, but the announcement had unfortunately miscarried.

A letter from G. A. Bushby, Esq. Officiating Secretary to Government, General Department, intimating the resolution of the Right Hon'ble the Governor General in Council, that the privilege of franking accorded to

the Secretary of the Asiatic Society, and extending to the Journal of the Asiatic Society, should cease from the 4th June, 1834.

After some discussion, the Secretary was empowered, in any representation he might think fit to make to the Government, on the plea of his engagement to print official documents of a scientific nature, to express the earnest desire of the Society for the continuance of a privilege which has already proved so highly beneficial to the interests and extension of Science in India.

Library.

The following Books were presented :

Marcel's Contes Arabes du Cheykh El-mohdy, for July, August, September, October, and November, 1832, and February, March, April, and May, 1833—*by the Author.*

Journal Asiatique, 64, 65—*by the Asiatic Society of Paris.*

Abdul Mujeed's edition of the Seyr-ul Mutakhereen, 1 vol.—*by the Editor.*

Sixth volume of the Transactions of the Medical and Physical Society—*by the Society.*

Select Speeches of John Serjeant of Pennsylvania—*by Herambanath Thakoor.*

The following works, published under the auspices of the General Committee of Public Instructions, were forwarded by the Secretary, Mr. J. C. C. Sutherland.

Inaya, vol. 4.	Fatawa Alemgiri, vol. 4.
Kefaya, vols. 3 and 4.	Raghuvansa.
Aphorisms of Hippocrates.	Retnavali.
Sudeedee.	Wilson's Sanscrit Dictionary.

Meteorological Registers from July to November, 1833—*by the Surveyor General.*

MS. Register of the Weather at Jorhat, Assam, for the months of August and September, 1833—*by Mr. H. Bigge.*

The following books were received from the book-sellers :

Lardner's Cabinet Cyclopedia, Herschel's Astronomy.

——————————— Chronology of History.

Read an extract of a letter from Captain J. B. Jervis, Bombay Engineers.

The letter announces, that the writer is engaged in the publication of a systematic account of the weights and measures of India, to which is annexed an account of Indian Chronology, gleaned from the Vedas, Siddhantas, Puránas, &c. and brought into one view with the systems that have prevailed in all ages over the world. Whence he has deduced that all have a common origin, and that the measures of time in use among the Hindus were introduced so late as A. D. 607-8. The work is in octavo, 700 pages, and is now nearly through the press. It is to be published by subscription.

Resolved, that the prospectus be circulated among the members, and a list of subscribers returned to Captain Jervis.

Antiquities.

A large Lingam, from the Jangíra rock—presented by Lieut. T. S. Burt, Engineers.

An ancient Hindu gold coin (corresponding with No. 17 of WILSON's plates, As. Res. xvii.) was exhibited to the meeting—by the same.

Accurate drawings of the stone *lath* or column now lying in the Fort at Allahabad, and fac similes of all the inscriptions on it; and a small fragment of the stone—by the same.

A paper on the subject, by Lieut. BURT, was read.

A *talwar*, or native sword of iron, dug up from six feet under the bed of the Jamna river, was also presented by the same.

The weapon is of the modern form, and was probably lost with some wreck; it was corroded nearly through its substance.

A manuscript table exhibiting the particulars of the twenty-four Jinas of the Budh religion, drawn up by a Pundit at Hyderabad—presented by Mr. E. C. RAVENSHAW.

Museum.

A piece of planking and copper sheathing, from the bottom of the Barque Adele, pierced by the horn of an unicorn fish, on her voyage from Penang to Akyab, on the 24th January, 1833—presented by Dr. TWINING, on the part of Dr. BAKER, Civil Surgeon of Noacolly.

The following extract from the log of the vessel was read:

Lat. 9° 23′ 53″ north, Long. 96° 31′ 45″ east, at 8h. 3m. P. M. of the 24th Jan., felt a sudden very severe shock aft, which made the vessel shake: could not account for it.

26th January. Found the vessel leak slightly, in consequence as supposed of the shock.

12th February. Lying at Akyab; cleared away sand-ballast, to examine the cause of the leak. Found a rent in the ship's bottom, caused by the horn of an unicorn fish thrust through the copper sheathing, and four inches of planking; the horn protruded seven inches on the interior, and had been snapped off close to the copper on the outside by the struggles doubtless of the animal to disengage itself.

EDWARD MARGUARD, *Commander.*"

A stuffed Pangolin, or five-toed Manis—presented by Dr. BURLINI.

Two tigers' heads; the skin of a Boa Constrictor, 14 feet long; two stuffed birds; two triangles, ornamented with peacock's feathers; an Assamese hat, and other Curiosities from Assam, were presented by Dr. BURLINI, in the name of M. B. BIANCHI.

Further specimens of the Hoshungabad coal were received, from Captain J. R. OUSELEY.

Although of a better quality than the former specimen, (see page 485,) this slaty coal is still very inferior, being in fact little better than a bituminous shale; its composition agrees nearly with that of the specimen inserted in the table of India coals, page 283 of the GLEANINGS, vol. iii.

Specific gravity	1.510	
Composition:—volatile matter	34.0	100.0
Carbon.....	39.7	
Red earthy ash	26.3	

It burns with a good flame, and leaves a slaty ash.

Specimens of the fossil bones, kankar, and rocks extracted from the bed of the Jamna—by Lieut. T. S. Burt, Engineers.

These form a valuable addition to the fossils presented in the name of Captain E. Smith at the last Meeting, and they contain the following bones not found in that series :

14. Fragments of the tusk of an elephant : one piece of very large size.
    The patella or kneepan of ditto.
13. Teeth of the camel ?
15. Tooth of a horse.

Part of the jaw of a human skull, and one other bone, were evidently recent, burning before the blowpipe, &c. whereas those in the fossil state did not contain the slightest trace of animal matter, and were of much higher specific gravity than ordinary bones : the animal matter seemed principally replaced by carbonate of lime and clay-iron. Drawings of the three teeth, marked as above, 13, 14, 15, have been inserted in the Plate of Captain Smith's collection, (Pl. xxv. of the present number.)

Lieut. Burt also presented a collection of nine species of shells found in the bed of the Jamna at *Kárim Khán.*

Captain E. Smith's notes on the kankar formation, and on the fossil bones, collected in the Jumna river, were then read.

Also a letter from Dr. H. H. Spry, on the subject of the fossil shells, presented by him at a former Meeting.

[Both of these are printed in the present number.]

A map of a route from Hoshangabad to the Fort of Makrai, in the Kalí-bhít hills, was presented in the name of Lieut. R. H. Miles, with remarks on the Goand inhabitants, and on the features of the country, by the same officer.

A note on the climate of the fossil elephant, by the Rev. R. Everest, was read.

[These will be printed in an early number.]

Thanks were voted for the several contributions of the evening.

X.—*Miscellaneous.*

[original communications.]

1.—*Note on the Tailor Bird's Nest.* By Lieut. Gifford.

" I send you a tailor bird's nest along with the Journal of the Asiatic Society, in which I see a description is given of it. This is the third nest I have found ; the first one was built in a *banghen* bush ; the two last in a low thick shrub (name I know not,) but the natives make a reddish dye from the flower, which is a very light yellow colour, with pretty large leaves.

The specimen I send you was constructed of three green living leaves, with two small old (dry) ones, to fill up a space where the living ones would not meet. The leaves were sewn together with raw and spun cotton ; the bird is a light brown above, and a dirty white below, about four inches in length from tip of bill to end of tail : the *málís* call the bird *Phutki.*"

2.—*Note on the Inscription on the Hindu Coin. (Pl. VIII. Fig. 15.)*

At page 415 of the present volume I stated, that the characters of the inscription on the reverse of the ancient gold coins of Hindu fabrication from Kanouj, represented in fig. 15, and in several coins of Plate I. vol. xvii. Asiatic Researches, was not legible. Mr. WILSON had however suggested, that the three first letters agreed with the ancient Nagarí characters साक, and I find on referring to Dr. BABINGTON'S *Account of the Inscriptions and Sculptures at Mahámalaipúr*, that all of the letters may be unquestionably identified with the ancient Sanskrit characters of the *Ratha* sculpture, so ably decyphered by that gentleman, and of which he has given a complete alphabet in the same volume.

The first letter is probably स rather than म or प although as observed by Dr. BABINGTON, these letters are very similar in form; the fourth letter is म and the whole word thus restored becomes clearly साकम: but the meaning is still as hidden as ever; and if it be a proper name, none such is to be found in the catalogues of Hindu princes.—ED.

3.—*Radiation in Valleys.*

Mr. W. Cracroft, in 1832, made the following observations for several mornings at sun-rise, in passing over the Kasya hills, on the radiation of heat to the sky.

Date. Jan.	*Place.*	*Therm. suspended.*	*Therm. on straw.*	*Remarks.*
13	Surárím,	38°	——	
14	Mouflong, 9 A.M.	30	27-5	ice formed in a tumbler in the house.
15	Myrong,	27	24	
16	Nanklao,	39	34	at top of hill, brisk wind,
		31	30	at bridge, in valley, 130 feet lower.
17	Ditto,	33	30	at top of hill, little wind.
		30	27	at bridge below.
18	Ditto,	42*	30	at top*, six inches above the ground.
		28.5	25.5	at bridge, ditto
19	Ditto,	49	——	on top of hill on a mat, ice within six inches of bulb, out all night!(?)
		27	26	at bridge.
20	Mopea,	43*	39	at top of hill*, two feet raised.
		33	32	at bottom of valley, 80 feet below.
21	Ongshye,	37.5	37.5	heavy dew, same on straw.
22	Ránígaon,	50‡	46†	‡4 ft. from ground. †In a ditch 2 ft. dp.

From the above, it may generally be remarked, that the bottom of a valley is much colder than the top of a hill at night; although the latter must be much more open to radiation: aërial currents may be the cause of this apparent anomaly.

4.—*Bones in the Delta Alluvium.*

In the Report of the Asiatic Society's Committee on the boring experiment an observation occurs, that some bones were discovered in the strata of blue clay alluvium of the circular canal, at a depth of about 20 feet below the surface: on reference to some old papers in Mr. Wilson's possession, a memorandum has been met with of a similar fact observed on digging a tank at Dumdum, in the year 1813. Lieut. J. COLVIN, Engineers, describes the circumstance as follows:—"The soil is throughout a fine garden mould, from two to three feet thick:—there are no nálás visible, but Dumdum is nearly surrounded by jhils and salt-water lakes. The bones form a kind of regular line with some intervals of a foot or two between them; they lie pretty close together, their interstices filled with earth. They are

so soft that all but the thickest bones break on endeavouring to separate them from the earth. I cannot say to what animal they belong, but I am very sure there are now no animals at Dumdum to which such large bones could have belonged, and I have never heard of any kind of deer near the place. The tree was found at a depth of 18 feet below the ground; it seems to be Soondry, (as is the case with most of the wood found in similar situations elsewhere.)"

We hope when a deposit of bones is again found, either at Dumdum or in any other parts of the Delta, some pains will be taken to extract them carefully, for comparison with existing species of the inhabitants of the present *Sunderban* swamps and forests; for, although, geologically speaking, they are of very modern origin, and we trace in the names of villages considerably higher up the Delta the fact of the present continent having at one period been divided into islands: such as Agardwíp, Sukhsagar, &c. Still at the present observed rate of recovery of flooded Sunderband land, it appears to require a very lengthened process to fill up from 18 to 25 feet of alluvium over the peat stratum, which was evidently the Sunderban vegetation of the time. History lends no aid in defining the sea boundary at different epochs. We must therefore seek the aid of physical research to solve the interesting question of the growth of the Delta. J. P.

5.—*Fall of Fish from the Sky.*

The phenomenon of fish falling from the sky in the rainy season, however incredible it may appear, has been attested by such circumstantial evidence, that no reasonable doubt can be entertained of the fact. I was as incredulous as my neighbours, until I once found a small fish, which had apparently been alive when it fell, in the brass funnel of my pluviometer at Benares, which stood on an insulated stone pillar, raised five feet above the ground in my garden. I have now before me a note of a similar phenomenon, on a considerable scale, which happened at the Nokulhatty factory, zillah Dacca Jelalpur, in 1830.

Mr. Cameron, who communicated the fact, took the precaution of having a regular deposition of the evidence of several natives who had witnessed the fall, made in Bengalee, and attested before the magistrate: the statement is well worthy of preservation in a journal of science; I therefore make no apology for introducing a translation at length. The shower of fish took place on the 19th February, 1830, in the neighbourhood of the Surbundy factory, Feridpoor. J. P.

Deposition of the Witnesses to the Fall of Fish from Heaven, on the 9th of Phalgun, 1236, B. E. at Havelli, zillah Dacca Jelalpur.

1. Shekh Kitabuddin, son of Shabdi, and Shekh Shumsuddin, son of Bakshu, were called, and declared in their deposition, saying, "That on Friday, in the month of Phalgun, we do not recollect the date, at 12 o'clock P. M., the sky being cloudy, there was slight rain, and a number of fish of different kinds and sizes fell from heaven; we took some of these fish and retired home. This is the account which we know."

2. Shekh Sulimuddin, son of Ibadullah, inhabitant of Bibhagdi, declared in answer, saying, "On a Friday, in the month of Phalgun, the date of which I do not recollect, at 12 o'clock evening, while I was coming from a village named *Nukolbati*, I perceived a *badali* fish, large about one cubit, fall before me from the sky; after which, I went further, and found another fish of the same size, lying upon the ground. I picked up these two fish and proceeded forward; and as soon as I arrived at home, I found, to my great surprize, that many persons had likewise collected fish, and carried along with them. This is all, and I know no more."

3. Shekh Munirnddin, son of Mydi, inhabitant of Umerbati, expressed in his deposition,—"About 12 o'clock P. M. on Friday of Phalgun, the date of which I have forgot, the clouds being gathered together, began to rain, and a little after, many fish, large and small, began to fall from the sky. I picked up some of them and carried to my house, but I did not like to taste any of them. I know no more of this account."

4. Fakirchand Chang, inhabitant of Nagdi, was called in, and declared in his deposition, "That in the month of Phalgun, the date and day of which have escaped my memory, at 12 o'clock P. M, the sky began to be cloudy, and to rain little; while I was sitting in the front part of my cottage, I observed a *mirgal*, and some other fish, *bodulis*, &c. of different size, fall from the sky. I picked up about five or six of these fish to satisfy my curiosity, but afterwards threw them away, and did not eat them at all. This is my account."

5. Shekh Chaudhari Ahmed, son of Mutiullah, inhabitant of Nagdi, relates in his deposition, "That I had been doing my work at a meadow, where I perceived at the hour of 12 o'clock, the sky gather clouds, and began to rain slightly, then a large fish touching my back by its head fell on the ground. Being surprised, I looked about, and behold a number of fish likewise fell from heaven! they were *saul*, *sale*, *guzal*, *mirgal*, and *bodul*. I took 10 or 11 fish in number, and I saw many other persons take many—then I returned home, I looked at heaven, and I saw like a flock of birds flying up, but these my perceptions was not clear enough. Amongst these fish, many were found rotten, without heads, and others fresh and perfect; and amongst the number which I had got, five were fresh, and the rest stinking and headless.

6. Shekh Turikullah, inhabitant of Nagdi, 12 years of age, declared in his deposition, "That in the month of Phalgun, on a certain Friday, I do not recollect the date, while I was sitting in my own house, I perceived a number of fish fall from the sky, some of them on the roof of my cottage; one of them was large, about one cubit, and three seers in weight. I know no more."

7. Shekh Suduruddin, inhabitant of Nagdi, was called in, and declared in his deposition, saying, "On Friday, at 12 o'clock P. M. in the month of Phalgun, I do not recollect the date, when I was at work in a field, I perceived the sky darkened by clouds, began to rain a little, and a large fish fell from the sky. I was confounded at the sight, and soon entered my small cottage, which I had there, but I came out again as soon as the rain had ceased, and found every part of my hut scattered with fish, they were *boduli*, *mirgal*, and *nouchi*, and amounted to 25 in number.—I know no more."

8. Shekh Katbuddin, inhabitant of Nagdi, relates in his deposition, saying, "At 12 o'clock P. M. of Friday of Phalgun, the date I forget; as I was coming from the *fields*, I saw a number of fish spread on the bank of a nálá. I picked up six of them, viz. two *boduli*, two *mirgal*, and two *nouchi*, besides these, there were many other fish of numerous kinds, and they were witnessed by many persons who were there. Some of these fish were fresh, but others rotten and without heads. I know no more."

9. Sree Dipchundra Bundopadhya, son of Puncharam Bundopadhya, inhabitant of *Sobindi*, aged 45 years, declared in his deposition, "That in the month of Phalgun, I cannot recollect the date, seeing the sky commenced to gather clouds, I sat down near the door of a workman's cottage; it was then precisely 12 o'clock, when a drizzling rain began to fall; and at the same time, two *boduli* fish fell down from heaven. I soon got up and marched on, and in the midst of the road,

saw several other fish fallen before me. I picked up some of these fish—but one named Banchha Ram Chung forbade me, saying, 'Do not touch these fish; you do not know what fish they are, and how they have fallen here.' Listening to him, I threw away all the fish, and went away. This is my account of the fish."

[Several other depositions of those who were not immediately eye-witnesses are omitted.]

6.—Fossil shells near Herat.

[*Extracts of a letter from Dr. J. G. Gerard, dated Herát, 21st June*, 1833.]

"I have discovered the locality of a large deposit of organic exuviæ within thirty miles of this place (Herát), but have not thought it prudent to visit the spot, lest I should find myself unexpectedly in the hands of the Túrkomans.

"The fossils correspond to the species represented as Pecten,—they abound in the side of a mountain, which is evidently calcareous, but are especially found in a water-course, being rolled from their situs by that agency. Judging from the elevation of this city, which by the ebullition of water (207½) approaches to 2,800 feet, if the barometer stood then at 30,000* the locality of the fossils may be deduced at a height of between 3 and 4000 feet. Elevation in such objects has ceased to be interesting, since the new theory of subterranean projection has deprived it of a *miraculous* aspect. Monsieur Jaquemont when at Simla, read to me (*explained*) a letter he had received from another traveller, Mons. Elie de Beaumont in South America, I think, wherein it was mentioned, that there was a subterranean connexion betwixt the most distant mountain ranges, and that a simultaneous movement was actually going on (traceable) by which their masses were gradually elevated."

7.—Cochineal.

"I hear the Cochineal insect is here, but not appreciable, that is, it cannot be turned to account, from the inability of the people to dry it properly; this is at least one cause. I have been asked the method of its preparation, but all my knowledge extends to a faint recollection of the process adopted by the South Americans, treated of in Humboldt's published Account of New Spain. Artificial heat is there used to kill the insect. Query, may not the very mode of extinguishing life affect the properties of the colouring matter? Certain it is, that in preparations of insects, this is so much a necessary precaution that various gases, the air-pump, &c. have been resorted to for the better preservation of the hues and form of the specimens. Do we not know that there is virtue in the manner of killing animals for our daily aliment?—that the anatomist can readily discover the effects of disoxygenation (in suffocation) upon the blood and even the muscular fibre, that electricity (lightning) and the Simoom not only change the color, but produce decomposition of animal matter when their effects are fatal. I don't remember what Humboldt says on the subject, but the complaint here is, that the insect cannot be killed without a degradation of its virtues. It is found in the root of a plant that flourishes in a marsh, and many people here have exhausted their skill in endeavours to appreciate its value: most of what reaches Herát is imported from Bokhara where it is received from Russia, and I believe from Yarkhund; the latter need not surprise us if indeed the insect is an inhabitant of that country; the industry and artificial expertness of the Chinese almost lead us to the conclusion.

A species of Cochineal, or at least a substitute, is found in India, but I suspect that the mercantile article is an import from South America. As climate has such

* As the observation was made in June, when the sea barometer would stand at 29.5, the altitude may be more correctly assumed to be 2,000 feet. See page 199.—Ed.

an effect upon the productions of animal and vegetable existence, and an arid one towards the improvement of a great many of them, especially Horticultural, while the softness of the goats' fleece seems to owe its existence to that cause,—the silk-worm its superior procreative powers, and even the silk its finer structure;—the cats of those regions, Cabul especially, are well known;—when these and thousands of others are the effects of those bright and eternally blue skies, we may infer that the kírmes (Keerm, worm), or cochineal of Herát, Bokhara, and other places requires only the application of skill to render it an appreciable commodity, and even superior to the American species, except indeed that comes from the dry regions of Chili and Peru. The bazar (retail) price of Cochineal at Herát is now six Rs. per seer, country measures, or 32 St. Rs. per Indian seer. The moist opium of the place sells at 44 Rs. per seer of India, and after one year when it is pretty dry, at 70 Rs.! while a species that comes from Yezd and Kaín in Persia, in sticks like sealing-wax and as brittle as a dried reed, sells at the enormous price of 80 to 100 Rs. per Indian seer. At Bokhara I procured some at 90 Rs. methinks the Hon'ble Company's opium from Malwa at a productive cost of three Rs. per seer, would realize remunerating profit in this country, where every production of nature or art is so exorbitantly high-priced, (valuable.)"

8.—*Reply to the Questions of the Burmese Philosopher-Prince.*

Sir,

Having not yet seen, in your interesting Journal, any replies to the questions proposed by the Burmese Prince, in vol. ii. p. 47, I venture to send you the following for insertion, and hope they may be found satisfactory.

Investigation of Sir Isaac Newton's statement, that some Comets have been raised, by the effect of the sun's rays, to a heat, 900 times greater than that of red hot iron.

Reply to 2nd Question.

It is a well known fact*, that the force of heat varies, inversely, as the square of the distance of the direct cause of that heat, from the object affected by it; so that in order to determine the above point, it is only necessary to refer to the distance of the sun from the earth (95 millions of miles), where the measure of force of his rays is known, and having the distance of a Comet from the sun, to ascertain by the above rule, the degrees of heat to which the Comet has been raised, and then with the aid of Wedgwood's, or any other pyrometer, shew, by calculation, the excess of heat of the Comet over that of red hot iron for the answer.

In Newton's Philosophy by Maclaurin of the year 1748, page 373, it appears, that the Comet of 1680 approached 166 times nearer to the sun, than our earth is; let this Comet therefore be taken for the investigation.

Now the distance of the earth from the sun, 95,000,000 miles divided by 166 times is = 572,300 miles, or distance of the Comet from the sun; consequently, by the above rule inverse, as the square of 572,300 viz. 327,527,290,000 miles to 100 degrees of heat here, so is the square of 95,000,000, or 9,025,000,000,000,000 miles, to 2,755,500 degrees of heat of the Comet.

The degrees in Wedgwood's Pyrometer, are reduced to their equivalent in Farenheit's thermometer by multiplying them by 130, and adding 1,077; because each degree of the former, is equal to 130 of the latter, and Wedgwood's first degree commences at Fahrenheit's 1077th, (vide Fyfe's Elements of Chemistry of

* Vide Ferguson's Astronomy, of 1790, p. 88.

1827, vol. I. p. 19.) Assume 100° of Farenheit, for the measure of the heat experienced on the surface of the earth, by the direct influence of the sun's rays.

It is stated in the work above quoted, that silver melts at 22 degrees of Wedgwood, and as I am not at present exactly aware, at what degree of heat iron becomes red hot, I will assume that of silver, just going into a state of fusion, instead of it*.

Silver melts at 22° of Wedgwood, and 22 multiplied by 130 plus 1077, equal 3,937° of Farenheit*, therefore, the degrees of heat of the Comet, 2,755,500° divided by 3,937°, or heat of melting silver, will make the heat of the former, 700 times greater than that of silver going into a state of fusion.

(Maclaurin, without investigating the truth of the remark, says, the Comet conceived a heat, 2,000 times greater than that of iron almost going into fusion. This must be a mistake, for I find that iron fuses at 158° Wedgwood, = 21,617° Farenheit, so that, using this as a divisor, instead of 3,937°, we obtain only $127\frac{1}{2}$ for the number of times excess of the Comet's heat, over that of iron in a state of fusion).

For gold under the same circumstances, 32° W. = 5,237° F., at which it melts: therefore 2,755,500° ÷ 5,237 = 526 times excess of the Comet's heat over that of gold in a state of fusion.

Tin melts at 442° F. (Fyfe, vol. II. p. 35,) therefore 2,755,500 ÷ 442 = 6,234 times excess of do. over tin. (But at page 21, vol. I. Fyfe says tin melts at 644 F., therefore 2,755.500 ÷ 644 = 4,278 times do. do).

Copper melts at 30° Wedgwood = 4,977° F., therefore 2,755,500 ÷ 4,977 = 554 times for the excess over copper, in a similar state.

Lead at 612° F.; therefore 2,755,500 ÷ 612 = 4,502 times of same over lead in fusion.

I believe Sir Isaac Newton's mode of measuring the quantity of caloric, in heated bodies, was, by their rate or time of cooling, to a degree equal to that of the surrounding medium.

It does not, however, so far as I can see, follow, that the interior, to the very centre of the comet, becomes heated by the sun to so great a degree, as is here indicated, and which affection applies to the surface particularly, for, the time that the Comet is exposed to the sun's rays, its rate of motion being increased in proportion to its proximity to the sun, (so as always to describe equal areas in equal times,) would probably be of insufficient duration, for so large a body to conceive, to its centre, this immense degree of heat; for, the comet has, no doubt, its seasons, and days and nights, as well as the earth, and much free space, almost void of the sun's heat, or even his light, in which to lose its caloric.

Since writing the above, I see by Mr. James Prinsep's experiments in the Asiatic Journal, vol. ii. page 140), that iron heated "uniformly to a glowing red," measured 1609° of temperature, Fahrenheit; if this be used as a divisor, instead of the former denominator, for the melting silver, we shall obtain as follows: 2,755,500 ÷ 1609 = 1712.554 times excess of the Comet's heat over that of red hot iron.

It is evident, that this amount must fluctuate, in exact proportion to the number of degrees, assumed for the measure of the sun's heat, as felt upon this globe, and which I have taken at 100°; but it appears that the sun's heat at Montpelier, raised Amonton's thermometer, on one occasion, to the height of boiling water, or 212° Fahrenheit, (see Hutton's Math. Dict. of 1815, p. 640). This would increase the

* Vide Ferguson's Astronomy, of 1790, p. 88.

above amount (by 2. 12 times) to 3,630 times, but taking the general average heat of the air, in the shade, in hot countries, at 70° only, the amount would be 7-10ths of the above, =1200 times nearly; while for England, assuming 50° as a mean, we have one half of the 1712=856 times excess of heat of the comet of 1680, over that of iron raised to a glowing red: this is tolerably near the 900 times mentioned by the Burmese prince; but the medium heat of air, out of doors in the shade in England, is about 51. 4°, so that, multiplying 1,712. 554 above mentioned, by 51.4 = 514 we get 880¼ for the excess of heat, differing only by 19¾ from the answer sought: but we get it nearer, by using the 100dth. part of the mean heat of the thermometer, out of doors, = 51.4 and of that within doors, 52.9 mean = 52-15 instead of the last mentioned .514dth., for we have 52.15 for the multiplier of 1,712,554, and the product is 893 times, instead of 900 as desired, and lastly, it becomes still nearer, viz. 905.9 times, by using the mean heat within doors or 52°.9 as above. This will, I trust, be considered sufficiently near and satisfactory. (N.B. It is equal to the quotient of $(95.000000),^2 \times (572,300)^2$ × by $1\frac{5\,2\,9}{6\,0\,5}$).

Afer the above was written, I found in the 1st volume of the Gleanings of Science, page 96, that Mr. Prinsep has noticed the little reliance which is to be placed on Wedgwood's Pyrometer, the degrees of which I have used in the former calculations: this will not, however, affect the answer last given, viz. 905.9 where I have quoted that gentleman's own experiment, so that the statement is left nearly as I had at first written it; but as the measure of temperature, of some of the metals there shewn, differs considerably from the corresponding ones here noted, it is right to state, that in that work the metals are represented to melt, at the undermentioned degrees of heat:

Silver at	4777° F. or its equivalent of	Wedgwood.
	2233° F. ..... do.	Daniel.
	1830° F. ..... do.	Prinsep.
	1822.7 F. ..... do.	Morveau.
Gold at	2822.6 F. ..... do.	Morveau.

The degree of heat of the comet above fusing silver, &c. will therefore be as follows, taking 100° for *our* temperature:

For melting Silver,	2,755,500 ÷ 4,777 = 576 times	using Wedgwood's	measurements of temperature.	
	2,755,500 ÷ 2,233 = 1,234 .. do.	Daniel's		
	2,755,500 ÷ 1,380 = 1,595 .. do.	Prinsep's		
For Gold.	2,755,500 ÷ 1,822.7 = 1,611 do.	Morveau's		
	2,755,500 ÷ 2,517.6 = 1,094 do.	Morveau's		

Correction.

Instead of 2,755,500 as a numerator, on the assumption of 100° being the heat on the earth, take the medium heat, as before, 52°.15, and the quotient of $95,000,000^2 \div 572,300^2$ =or 1,436.990, and divide it by the degrees of the metal, thus;

Than silver fusing, the comet is 308 times hotter, by using Wedgwood's degrees 4,777,

——— Do.	1,436,990÷2,233	= 643½ times	by Daniel's Do.
——— Do.	1,436,990+1,830	= 785° ———	Prinsep's Do.
——— Do.	1,436,990÷1,822.7	= 788° ———	Morveau's Do.
Gold	1,436,990÷2,517.6	= 570° ———	Morveau's Do.

For iron raised to a full red heat, (1,200°, according to Prinsep,) 1,436,990°÷ 1,200° = 1,197.5 times, by using Prinsep's degrees.

For do. raised to an orange heat, 1650° P. 1,436,990÷1,650=870 times by ditto.

Reply to 3rd Question.

I almost fear to venture an opinion on the next question, but I should say, that the atmosphere is certainly, as the querist supposes, attracted, by the sun and moon, when in conjunction, or opposition, in the same manner, as are the tides of the ocean, or as any other light fluid, would be; but why the barometer is not sensibly affected, at these periods, I can only ask, whether he is sure that it is not so affected, or so much, at least, that a fair conjecture may be hazarded, that its rise is proportional to the increased height of the atmosphere, (if such indeed occur, at the time of high tides,): our purpose will, therefore, be to see, whether the barometer can indicate this rise, or not, and if it do, to determine, what the amount of that difference is.

May not one objection however be made, that will have a tendency to controvert this opinion, which is, that the force, exerted by the moon or sun, or both, to elevate the atmosphere, above its usual level, might, on account of the elasticity, or buoyancy of this body, destroy the additional weight, that would, otherwise, be added to it? In other words, would not the force of attraction, here supposed to cause the additional height, by the hold, (if I may say so,) that it has on the fluid, keep it in equilibrio, without adding any thing to the weight, by the increase of the part so added?

This remark will not, of course, apply to water, but will it not to air, which is an elastic body? If not, then I must resort to the first supposition, that there *is* a rise of the barometer, and that it is proportional to the increased height of the atmosphere, caused by the attraction of the sun and moon.

If the height of the atmosphere were uniform, and of the same weight, as it is at the earth's surface, pressing about 14¾lbs. on the square inch, it would extend no farther than to the height of 5¾ miles, or thereabouts, (see Hutton's Course, p. 244, vol. ii.) whereas it reaches to between 40 and 50 miles, (the boundaries of twilight only included, the air being so thin and attenuated, beyond that distance, that its comparative weight amounts to almost nothing).

Now, if the height of the atmosphere be increased, by any cause, (excluding heat, which would, however, have something to do with that increase, but has or has not to do with this investigation,) beyond the height of 45 miles, a proportional part must be reduced, in height, on the sides of the earth, which are at right angles to the horizon, acted upon by the sun and moon, to make up for this quantity, unless it be rarefied and of itself kept in equilibrio by attraction, as above supposed: it cannot be very great, but supposing it to be proportionally raised, as much as the sea, what will be the pressure gained, in this, upon one square inch, at the surface of the earth, and also, at what height will the barometer stand, in this case?

Taking 12¾ feet, which is about the height of the tides, or what is added to the ocean, by the attraction of the sun and moon, either when in conjunction or opposition, and assuming ⅓ of a mile, or 1760 feet, as the average depth of the ocean, of which 12¾ feet is near the 138th part; by taking the 138th part of the atmosphere's height of 45 miles, as above, we get .326087 parts of a mile for the additional height of the atmosphere, gained by the force of attraction, consequently, if 45 miles press upon the surface, with a weight of 14¾ lbs. per square inch, 45.326,087

miles will press with a weight of 14.856,884,072 lbs. on every square inch, and then to get the height in inches, gained by the barometer, we have 14¾ lbs. to 30 inches, (or general height of the barometer at the level of the sea nearly,) as 14.856,884,072 lbs. to 30.217,4 inches nearly, or .217,4 decimal parts, rather more than ⅕th of an inch only for the measure of height, gained in the barometer, by the additional weight of the 138th part of the total height of the atmosphere, caused by the attraction of the sun and moon, in a similar manner, and in the same proportion, as the tides are raised above the level of the sea.

Very nearly the same answer is obtained, by considering the atmosphere so condensed, as to have its specific gravity equal to that of water; for, instead of the former height in miles, use 34½ feet height of water, which is equal to the pressure of the atmosphere, and higher than which a common atmosphere pump will not raise that fluid. Then 34½ feet divided by 138 as before is = .25 of a foot, therefore 34.5 feet height of water : 14.75 lbs. pressure on the square inch :: 34.5+.25, (or height of water plus its 138th part = 34.75 lbs.) : 14.856,876 lbs. pressure on a square inch, only exceeding the former 14.856,884,072 by the .000,008,072nd part of a lb. and proving the result of the former calculation to be correct.

In the above investigation, the specific gravities of air and water are taken as equal, but as they differ much*, and as I have no other data, let the height of the atmosphere be considered uniform, for 5¼ miles only, as before explained; the calculations will, on the foregoing principle, make the height, gained by the barometer, equal to only $\frac{1}{5}$th part of an inch, which is almost an inperceptible quantity, and shews, that that instrument cannot sensibly indicate the difference of altitude of the atmosphere, due to the attraction of the sun and moon, as supposed by the Burmese Prince; for 5¼ ÷ 138 miles=.003,804,347,8th part of a mile, when the atmosphere is uniform, and 5¼ miles high, therefore, as 5.25 miles : 14.75 lbs. :: 5.25+.003,804,347,8 miles :: 14.760,688,405,7 lbs; and again, 14¾ lbs. :30 inches :: 14.760,688,405,7 lbs.: 30.021,739,125 inches, or .021,739,125=$\frac{1}{5}$th part only of an inch gained in height by the barometer as above stated.

I subjoin a table of the heights of the barometer, in order that the differences, which I have shewn, for every month, may be observed, at the times of spring and neap tides, in Calcutta, for the satisfaction of the Burmese philosopher, should he think it necessary, to prosecute his inquiries any further into this subject.

Barometer at Sunrise, (reduced to 32° F.), at the Surveyor General's Office, Calcutta, taken from the As. Soc. Journal, vol. 1, for the year 1832.

1832.	Means. In.	Monthly Diff.		Temperature of Air.	Monthly Difference.	
				°	°	
January,	30.051	..		54.6	6.6	Increase.
February,	29.943	108	Decrease.	61,2	5.1	Increase.
March,	29.865	078	Decrease.	66,3	8.6	Increase.
April,	29.760	105	Decrease.	74.9	4 6	Increase.
May,	29.664	096	Decrease.	79.5	1.3	Increase.
June,	29.515	149	Decrease.	80,8	0.7	Decrease.
July,	29.489	026	Decrease.	80.1	0.1	Decrease.
August,	29.468	021	Decrease.	80.0	0.7	Decrease.
September,	29.650	182	Increase.	79.3	4.6	Decrease.
October,	29.837	187	Increase.	74.7	9.8	Decrease.
November,	29.997	160	Increase.	64.9	9.1	Decrease.
December,	30.998	001	Increase.	55.8		

* Viz. a $2\frac{2}{3}$ to 1000.

Reply to 1st Question.

Having attempted, as well as I am able, to satisfy the curiosity of the Burmese philosopher, on the above mentioned points, I trust I may, in return, be allowed to put a query or two to him, relating to the moon, as well as to Comets, [which I should, with reference to his question, suppose to have little connection with one another, because, the former is a planet, secondary to, or dependent on, the earth, around which, she describes her epicycloidal course; the earth, again, being dependent on the sun, and the sun appearing to govern the Comets, as they are all believed, or found, to pass round him]: if his highness cannot answer these questions, I hope that some other person, equally anxious for such investigations, will favour me by doing so.

Question 1st.

Why may not such comets as we know of, especially those, which have extremely elongated elliptical orbits, be considered, to possess two centres or foci within their orbits, one of them being our sun, and the other, any other sun, or star. Would not this disposition, supposing it to have been adopted all over the universe, have the effect of keeping the numerous systems in equilibrio, the comet incessantly acting as a link, or chain, connecting any two [or more?] of these systems, with the neighbouring ones?

Question 2nd.

If the moon have no atmosphere, [as is asserted by astronomers,] how is it possible to account for the distinct view, we sometimes obtain, of the circular dark part, which she presents at night; I mean, that part which is involved in shadow when the moon is in either her first or her last quarter?

Question 3rd.

Has it ever been ascertained, in what proportion, fluids are attracted, by the sun and moon, [or by any other bodies,] in terms of their specific gravities?

Are they, or are they not, attracted, inversely as the cube roots of their specific gravities; the distances of each fluid, from the centre of attraction, being equal?

Camp near Calpie, June, 1833.

I am, your obedient servant,
W. BURT, Engs.

To the Secretary, Phl. Class, Asiatic Society, Calcutta.

[EUROPEAN EXTRACTS.]

9.—*Cave of Secanderiah, near Tabriz.*

As the celebrated Cave of Secanderiah, resembling the Grotto del Cane in Italy, was only distant six miles, I proceeded to the village of Secanderiah, situated at the mouth of a very strong defile, formed by the river of Sied-abad; and having procured a numerous party of villagers with tools, combustibles, &c., set out determined fully to examine the cave, or at least to ascertain to what extent the

noxious vapour existed; we also took some fowls to see the effect procured on them. After a fatiguing walk of three miles, up rocky steep ravines, we arrived at the entrance of this singular cavern, the mouth of which was fifty feet wide and thirty feet high, descending very rapidly to a depth of thirty feet.

The guides set fire to some brushwood, and found the air much less noxious than usual; and it was only after a descent of 10 feet that we felt any inconvenience. We were absolutely standing on the bones of some animals which had perished there upon a former occasion; we remarked a dog, a deer, and two foxes: the head of a wolf lay at some distance. We, at the same time, put to flight a great number of pigeons, who build in the roof of the cave. We found that fire was extinguished at a few feet below where we stood, and the fowls died in half a minute. The sides of the cave had many marks of sulphur in powder amongst the soft sand and limestone, which were also strongly coloured with iron. Though the fire made with dry brush-wood and thorns, even when sprinkled with naphtha, was instantly extinguished, port fires and fuses burnt nearly the same time as in the open air. I was, therefore, enabled to fire a quantity of gunpowder at the very bottom. The quantity amounted to several pounds at the time, and that repeated often, had the effect of so entirely filling the cave with smoke, that we could no longer see any thing at the bottom. On again throwing in some fowls, they soon made their escape, and fire burnt at the bottom. I would not, however, allow any of the people to descend, which they appeared willing to do; a dog also ran in and returned in a few minutes. On a former occasion, when this cave was visited by a party of the Mission, accompanied by Mr. Browne, the celebrated African traveller, fire would not burn two feet below the entrance, and oppression was felt close at the mouth of the cave. Mr. Browne entered some paces by holding his breath, but an English officer attached to the Mission had nearly perished in attempting to follow him. He was instantly dragged out, and recovered with some difficulty. In the winter (subsequently to my second visit), after a strong gale, the wind from the N. W. had blown for some days directly into the mouth of the cave: we were enabled to walk all over it, and only in a deep hole, at the bottom, did there exist any noxious air. There a fowl died in two minutes, and from its cries appeared to suffer much. After sixty feet, we found the cave again ascended, and curved a little to the right: it then became exceedingly narrow and very low, forming a kind of passage, which did not allow of standing up; we could not see to the end of this even with a reflecting lamp, and none of us felt inclined to prosecute the discovery. I have only mentioned these circumstances to prove how much the extent and force of the vapour are affected by the state of the atmosphere, and by particular circumstances. As the ground slopes rapidly from the mouth of the cavern, both to the ravine and inwards, it might be cleared away with little difficulty, and the heavy noxious gas thus allowed to pass off; but with the exception of forming a large winter stable for sheep, no other good purpose could be answered by it; there was formerly a human skeleton, which has been removed; it was that of an old man in the village, who, tired of life, took this way of ending his misery; the peasants considered the circumstances of the cave being accessible little short of a miracle, but were much disappointed at not finding the treasure said to have been deposited there by Alexander, from whom it derives its name.—*Monteith's Tour. Jour. Geog. Soc.* iii. 6.

Meteorological Register, kept at the Assay Office, Calcutta, for the month of December, 1833.

Day of month.	Barometer reduced to 32° Farh.				Thermometer in the Air.					Depression of moist-bulb Thermometer.				Hair Hygrometer.		Rain.	Wind.			Weather.		
	At 4½ A. M.	At 10 A. M.	At 4 P. M.	At 10 P. M.	Minimum at 4½ A. M.	At 10 A. M.	Max. by Reg. Ther.	At 4 P. M.	At 10 P. M.	At 4½ A. M.	At 10 A. M.	At 4 P. M.	At 10 P. M.	At 10 A. M.	At 4 P. M.	Inches.	Morning.	Noon.	Evening.	Morning.	Noon.	Evening.
1	,957	,030	,919	,962	64,	73,8	83,8	77,8	69,2	5,0	8,2	11,0	6,4	83	77		o.	n.	n.	clear.	cumuli.	clear.
2	,927	,016	,878	,918	64,5	74,4	82,7	78,5	69,	1,5	6,5	9,4	2,9	86	82		s. w.	n.	o.	fog.	clear.	fog.
3	,901	,980	,890	,922	66,1	75,8	87,0	78,2	69,8	2,9	6,7	8,6	2,5	87	85		o.	n. e.	s. e.	fog.	do	fog.
4	,914	,000	,871	,901	67,3	76,0	84,0	80,4	71,8	2,9	6,0	9,0	4,5	91	83		n.	n. e.	s.	cum. cir.	do	clear.
5	,880	,950	,860	,882	65,7	76,6	82,5	80,0	72,2	1,5	5,7	7,4	4,0	90	87		o.	n.	S.	fog.	cl. str.	overcast.
6	,840	,926	,813	,865	71,2	77,7	81,1	78,2	70,0	2,2	4,3	4,5	0,8	96	94	0,25	s. e.	S.	S.	clear.	rn. cm. str.	bright.
7	,871	,984	,873	,951	66,7	75,2	84,0	77,4	68,2	0,7	5,7	8,4	5,2	90	81		o.	S.	e.	do	clear.	clear.
8	,928	,040	,830	,977	63,2	72,8	81,5	75,0	64,8	2,1	7,9	8,0	3.6	81	81		e.	N.	n w.	do	do	do
9	,923	,000	,888	,949	60,0	71,9	84,1	74,7	62,7	2,8	7,1	9,6	3,7	81	78		n.	N.	S.	do	do	do
10	,907	,980	,853	,879	60,2	71,3	83,7	75,1	67,2	3,0	6,8	8,6	5,2	85	81		o.	N.	o.	do	do	do
11	,826	,943	,852	,929	64,0	72,8	81,4	76,6	70,2	2,2	5,5	5,4	2,0	91	92		o.	e.	E.	do	overcast.	do
12	,925	,978	,879	,912	67,8	75,5	83,0	78,7	63,8	0,7	4,5	6,0	0,8	95	90		E.	E.	n. e.	cir.stratus.	do	do
13	,914	,970	,880	,939	63,5	74,0	87,0	77,8	67,2	0,8	5,5	9,6	1,1	90	80		o.	n.	n. e.	clear.	clear.	do
14	,916	,020	,908	,983	60,4	72,4	84,0	76,8	65,8	0,4	5,6	6,5	2,0	90	89		n.	n. w.	N.	do	do	do
15	,946	,032	,947	,008	61,8	73,0	78,4	75,0	66,7	1,4	5,5	6,2	3,4	91	90		n.	n. w.	n.	do	cumuli.	do
16	,989	,006	,924	,976	65,0	72,7	84,0	74,6	69,2	2,9	5,6	7,8	6,0	92	85		o.	n.	n.	cirri.	do	do
17	,917	,988	,900	,974	65,4	71,7	78,7	74,7	68,3	5,0	6,0	7,4	4,8	89	85		n.	n.	n.	clear.	overcast.	cum. strat.
18	,926	,986	,908	,945	64,0	72,7	74,5	74,4	68,2	0,8	4,5	5,0	2,1	94	94	0,20	E.	n. e.	o.	cloudy.	rn. cumli.	fog. low.
19	,920	,004	,915	,957	63,5	71,5	85,3	74,7	67,8	1,4	4,5	5,8	4,6	95	91		o.	n.	N. E.	clear.	clear.	clear.
20	,897	,941	,829	,959	63,0	72,1	74,6	71,8	64,0	3,4	5,6	3,0	0,3	91	96	2,10	n. e.	E.	n.	misty.	hard rn.	rain.
21	,860	,984	,900	,969	63,6	70,2	78,6	71,7	65,2	1,0	3,5	4,7	1,9	96	94		w.	n.	n.	cloudy.	overcast.	clear.
22	,949	,064	,970	,048	61,2	70,4	78,3	71,4	65,7	0,8	4,6	5,4	4,5	93	90		o.	n.	n.	clear	nimbi,	do
23	,011	,092	,960	,010	61,2	68,6	76,0	70,3	64,0	3,2	5,4	7,5	5,0	90	82		o.	n.	n.	do	clear.	do
24	,977	,045	,870	,920	60,3	68,5	78,0	71,2	65,0	3,3	4,8	6,2	4,0	92	88		n.	n.	o.	do	do	fog.
25	,862	,000	,848	,894	65,1	68,8	87,3	71,2	65,8	4,0	5,0	4,4	2,4	95	95	0,02	S.	S.	W.	nimbus.	cumuli.	cumuli.
26	,886	,000	,922	,026	61,8	69,1	81,7	70,0	61,2	2,7	5,6	8,2	4,7	89	80		o.	n. w.	n.	cir. cum.	clear.	clear.
27	,999	,115	,994	,032	55,6	67,6	85,1	68,8	61,8	3,2	6,0	8,5	2,8	86	79		n.	N. W.	o.	clear.	do	do
28	,986	,092	,970	,017	57,1	66,2	86,2	69,6	64,3	2,1	6,7	8,5	1,9	84	80		o.	N. W.	w.	do	do	cum. cirus.
29	,976	,085	,971	,993	58,1	66,4	76,8	70,0	65,1	2,9	6,5	8,0	1,7	86	81		o.	N. W.	o.	do	do	do
30	,994	,082	,972	,022	62,0	66,7	89,5	70,2	64,8	2,2	6,3	7,5	2,6	83	83		o.	N. E.	n. e.	cloudy,	do	stratus.
31	,012	,112	,000	,050	58,2	67,0	89,0	70,4	65,0	2,2	6-8	7,6	2,5	85	8		n.	N.	n.	cl ear.	do	, clear.
Mean,	29,927	,014	,906	,957	63,0	71,7	82,3	74,3	66,7	2,3	5,8	7,2	3,2	89,4	85,7	2,57	day breezes.			sharp cold weather.		

The instruments for 10 A. M. and 4 P. M. are suspended in the free air of the laboratory; those for 4½ A. M. and 10 P. M. in the south veranda of a third story near the cathedral. The Barometers both stand ,044 lower than the Surveyor General's.

INDEX.

ERRATA.

Page 87 line 35 *for* 'Col. Swiney,' *read* 'Dr. Swiney.'
—— 57 — 23 *for* 'Bu-stom,' *read* 'Bu-ston.'
—— 60 — 18 *for* 'grain,' *read* 'gram.'
—— 70 — 29-30 *for* 'in 17 hours 55 minutes,' *read* 'in the year 1755.'
—— 71 — 23 *for* '(5.1)' *read* '(6.1)'
—— — — 28 *for* '(6. ax.)' *read* '(ax. 6.1)'
—— — — 29 *for* '5.1' *read* '(6.1).'
—— 72 — 34 *for* 'the circle,' *read* 'a circle.'
—— — — 39 *after* 'G A' *insert* '(Fig. 3.)'
—— 73 — 21 *for* 'and also touches,' *read* 'and A D also touches.'
—— 74 — 12 *after* 'A B C,' *insert* '(Fig. 4.)'
—— — — 26 *after* 'A B C,' *insert* '(Fig. 5.)'
—— 154 — 5 } *for* 'J. S. Lushington,' *read* 'G. T. Lushington.''
—— 273 — 6 }
—— 268 — — *for* 'BC,' *read* 'BG.'
—— — — — *for* 'BE $\frac{1}{3}$ BC,' *read* 'BE—$\frac{1}{3}$ BC.'
—— — — 15 *for* 'to,' *read* 'therefore.'
—— — — 24 *for* 'others,' *read* 'other.'
—— — — 29 *for* 'further from,' *read* 'towards.'
—— 269 — 2 *for* 'valued,' *read* 'salient.'
—— — — — *for* '$\frac{1}{3}$ (ABI+18,)' *read* '$\frac{1}{3}$ (ABI+180°).'
—— — — 7 *for* 'Cardwide,' *read* 'cardioide.'
—— 270, under the word Fahrenheit, insert the following figures omitted by mistake:
633°.2 466 381.2 362.2 356.8 384.8 365.8 452.2 381.2
—— 272, in the mean height of the Barometer at 4 P. M. *for* '.545,' *read* '.513.'
—— 306 line 16 *after* 'Iskardo,' *insert* [Skardo, see mention of this place made by M. Csoma de Körös in vol. i. p. 125.]'
—— 334 — 10 *for* 'craigs,' *read* 'crags.'
—— 314 — 5 *after* 'Indus,' *insert* 'The date PIZ or 117 of the æra of the Seleucidæ, shews this to be a coin of Antiochus the Third: the emblem of a ship was common to Tyre and Sidon, and other sea-port towns.' [See Calmet's Dictionary of the Bible, vol. iii.]
—— 315 — 6 *for* 'antiquity,' *read* 'antiquities.'
—— 316 — 17 *after* 'Abhimanya' *insert* 'comma.'
—— 319 — 5 *for* '92″.174,' *read* '9′ 2″, 174.'
—— — — 9 *for* '118.7,' *read*—'1′ 18″,7' and *for* '1′ 8″.4' *read*—'1′.8ᵛ,4.'
—— — — 10 *for* 224.5,' *read* '+2′ 24″ 5' and *for* '0 42.7' *read* '+0.42, 7.'
—— 354 note 15 *for* 'scarcely or ever,' *read* 'seldom.'
—— 356 note — *for* 'alternate 10 and 11 syllables,' *read* 'alternate 11 and 12 syllables.'
—— 358 20 *for* 'गर्भो' *read* 'गर्भों.'
—— 390 — 27 *after* 'Karna,' *insert* '(T. *rNa-va-chan*), and dele the same word in the 29th line.
—— 392 — 7 *for* '*Gnag-hjog*,' *read* '*gnas-hjog*.'
—— 418 — 18 *for* 'stupenduous,' *read* 'stupendous.'
—— 438 — 24 *for* '(vague) 11 0 &c.' *read* '11 10 + 28 = 11 38' by Mr. W. Ewer's Chronometer.
—— 449 — 24, 32. *for* 'olefint,' *read* 'olefient.'
—— — — 26 *for* 'heat by,' *read* 'heat due to.'
—— 455 — 7 *for* 'operating,' *read* 'operated.'
Also supply brackets to inclose the following paragraphs:
Beginning with page 446, line 6, and ending page 448, line 28.
Ditto ditto page 449, line 3, ditto ditto page 449, line 34.
—— 472 line 21 *for* 'lucertina,' *read* 'lacertina.'
—— 489 — 36 *for* 'extent of coast,' *read* 'extent of land frontier to the East, North, and West of the British Possessions in India.'
—— — — 18 *for* 'thus weighed, the,' *read* 'thus the.'
—— 492 — 12 *dele* lifts.
—— 205 — 17 *for* 'lime and stone,' *read* 'limestone.'
—— 263 — 7 *for* 'Ludiya,' *read* 'Sadiya.'
—— 309 — 36 *after* 'building,' *insert* (See plate xix).
—— 549 — last *after* 'the fossil shell,' *insert* '(See plate xx).'

DIRECTIONS TO THE BINDER.

The sheets of Buchanan's Statistics are to be separated from the monthly numbers, and (being now complete) to be bound as a separate volume. The sheets of Appendix headed "Indian Monetary System" are also to be separated, and reserved to form part of a future volume.

The Plates may either be bound up at the end of the volume, or placed in the following order: